[COMMITTEE PRINT]

THE NATIONAL SCIENCE BOARD: SCIENCE POLICY AND MANAGEMENT FOR THE NATIONAL SCIENCE FOUNDATION

1968–1980

REPORT

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SCIENCE, RESEARCH AND TECHNOLOGY

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LETTER OF TRANSMITTAL

House of Representatives,
Committee on Science and Technology,
Washington, D.C., January 21, 1983.

Hon. Don Fuqua,
Chairman, Committee on Science and Technology,
U.S. House of Representatives.

Dear Mr. Chairman: The following report entitled "The National Science Board: Science Policy and Management for the National Science Foundation: 1968–1980" provides the first comprehensive, in-depth review by a committee of the Congress of the National Science Board, the governing board of the National Science Foundation. It covers a period during which the National Science Foundation grew rapidly and in which the National Science Board significantly expanded its participation in shaping the policies of the Foundation as the principal basic research and science education agency of the Federal Government.

As envisioned in the immediate post-war years by the framers of NSF's original charter, the National Science Board was to serve several functions. Made up of distinguished scientists, the Board was to serve as a buffer between the agency and the outside world; the Board was to provide general policy guidance to the Director and his staff in their conduct of scientific research support programs; and the Board was to review major, individual awards.

The present report provides a detailed and vivid picture of how the Board sought to define and exercise its role in matters of policy, such as support for basic research, applied research, and science education, and in matters of management, such as budget formulation, the agency's internal organization structure and the Board's relationship to the NSF Director. In providing a thorough analysis of these issues, the report provides our Committee with information and background about the role of the National Science Board needed for our review of the Foundation's Organic Act.

When the NSF Organic Act was developed in the years after 1945, the National Science Board was patterned after the enormously successful wartime Office of Scientific Research and Development headed by Vannevar Bush. That Office had functioned through a unique combination of scientific committees and a strong Director who had direct access to President Roosevelt. The committees were made up of scientists and research managers from the universities and industry, and that pattern was incorporated into the structure of a number of new agencies established to deal with the Federal Government's broadened role in science. The Atomic Energy Commission and its General Advisory Committee both made use of research administrators and scientists who had careers outside government. The short-lived Research and Development Board in the Department of Defense, which functioned from 1946 to 1953 with the active participation of Vannevar Bush, similarly brought non-government scientists into policy and management functions for defense research and development.

The National Science Board is today the only prominent survivor of the concept that government science is best managed by giving such a board of part-time, outside advisors a strong policy and management role. For the Congress the fundamental question is whether the continuation of that role will best serve the national needs and interests in the future, or whether a modified or alternate statutory arrangement will be more advantageous for the National Science Foundation and for the country in the coming years and decades. This report provides much information and analysis to assist us in forming our views on that question.

The report was prepared for our Subcommittee by Ms. Genevieve Knezo, an experienced science policy analyst with the Science Policy Research Division of the Congressional Research Service in the Library of Congress, and by Mr. Kenneth Bogen, formerly an analyst in the Science Policy Research Division. In bringing order and perspective to the massive records of the National Science Board over a twelve year period, Ms. Knezo, as project coordinator, has performed a truly outstanding job of research and writing. She has brought to the task wide experience in analyzing Federal science policy issues. We are indebted to the CRS and its able researchers for making available to the Congress this valuable, high-quality report.

The Committee is also indebted to the two distinguished scientists who successively served as Board Chairman during the period the study was conducted. When the study was initiated by my predecessor as Subcommittee Chairman, Congressman George E. Brown, Jr., the Board Chairman was Dr. Norman Hackerman. Dr. Hackerman saw the value of a careful, historical study of the Board's work and gave it his strong and steady support. As the study entered its concluding phases and the writing and review process was begun, Dr. Lewis Branscomb became the Board Chairman. Dr. Branscomb lent his support to the study with equal enthusiasm, and had, during the review process, the thoughtful assistance of the Board's most experienced member, Dr. Lloyd Cooke. Throughout the period of the study, the Board's Executive Secretary, Miss Vernice Anderson, provided much background and insight, and the Chairman's personal assistant, Ms. Mary L. Parramore, worked directly with Ms. Knezo and Mr. Bogen in making available both the many Board files and their own extensive knowledge and experience. Ms. Margaret Windus provided valuable assistance during the review phase after she became the Board's Executive Officer.

Because the Board's minutes and records include discussions of individual personalities who are being considered for Board membership or for senior positions within the National Science Foundation, and also because the Board proceedings include discussions of individual grant proposals and their comparative merit, those aspects of the Board's work must necessarily remain confidential. The CRS researchers were given access to all the Board's documents with the understanding that none of the specifics in these two areas would be included in the study, and the subsequent review by the Board confirmed that, in fact, this information remained shielded from public disclosure. We are indebted to both the Board and to the CRS for making the study possible under this constraint.

I commend the report to your attention and to the attention of all Members of the Committee on Science and Technology and of the House as a valuable contribution to our understanding of an important, but up to now less well understood part of the Federal science policy apparatus.

Sincerely,

Doug Walgren,
Chairman, Subcommittee on Science,
Research and Technology.

LETTER OF SUBMITTAL

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
Washington, D.C., July 6, 1981.

Hon. DOUG WALGREN,
Chairman, Subcommittee on Science, Research and Technology, Committee on Science and Technology, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Your predecessor as chairman of the Subcommittee on Science, Research, and Technology, the Honorable George E. Brown, Jr., requested the Congressional Research Service to prepare a background study for the Subcommittee on the National Science Board, in connection with its review of the organic act of the National Science Foundation. I am pleased to transmit the study, entitled "The National Science Board: Science Policy and Management for the National Science Foundation: 1968–1980."

Mr. Brown requested that "the study should be historical in nature and should trace the evolution of the Board since it began to function in 1952. I would ask that it cover the evolution of the Board, including its membership, changing role in policy formulation, budget development, long-range planning. . . . the committee structure of the Board, the Board's relationship to broader national science policy issues and organizations, and such other questions as your research suggests. I would ask also that, insofar as practicable, the study cover the broad developments within the NSF as a whole as they relate to the Board's activities with special attention to the 'second fifteen years' following CRS's earlier background study on 'the First Fifteen Years.' "

The enclosed study provides this historical perspective and also develops the issues in the context of current policy, in order to serve the subcommittee's current oversight needs. The first chapter provides a complete summary and compilation of observations made in the study. As your staff requested, we have included detailed appendix materials to serve as a readily available compilation of data on Board management and evolution, and on NSB-enunciated policy and procedural guidelines. The study also provides information on the evolution of the organization of the National Science Foundation since 1968 and on the identification of new programs begun since then. Materials also are included summarizing legislation which has affected the NSF.

The study was prepared by Genevieve J. Knezo, Specialist in Science and Technology, and Kenneth T. Bogen, Analyst in Science and Technology, of the Science Policy Research Division. Ms. Knezo served as the coordinator of the project. The study was reviewed by William

Boesman, Specialist in Science and Technology, and by Dr. Gail Marcus, Specialist in Science and Technology and Assistant Chief of the Science Policy Research Division.

This study has been an exciting challenge, a task aided by the guidance of your subcommittee staff, Dr. Albert Murray and Dr. John Holmfeld. Our appreciation also goes to the staff and members of the National Science Board for their cooperation in providing access to information.

Sincerely,

GILBERT GUDE, *Director*.

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ABBREVIATIONS USED

AR: annual report.
COB: Committee on the Budget.
CS: closed session.
EC: Executive Committee.
ES: executive session.
LRP: long-range planning.
N.A.: not available
NAS: National Academy of Sciences.
NSB: National Science Board.
NSF: National Science Foundation.
OMB: Office of Management and Budget.
OST: Office of Science and Technology (in the White House)
OSTP: Office of Science and Technology Policy (in the White House).
PC: Programs Committee.
PER: Planning Environment Review.
PPC: Planning and Policy Committee.
Res: resolution.
SE: Science Education Directorate.
STIA: Scientific, Technological, and International Affairs Directorate.
ZBB: zero-based budgeting.

A GUIDE TO FOOTNOTES

Material from open Board minutes is indicated by a footnote symbol of the meeting number followed by a colon and page number, such as 250: 21–22. Materials from closed session minutes are preceded by the symbol CS:, from executive session minutes by ES. Material from Executive Committee minutes is preceded with the symbol EC, followed by the number of the meeting and the page number. The annual report of the Executive Committee is abbreviated AR. NSB resolutions or documents usually are preceeded with the abbreviation NSB— or NSB/.

NATIONAL SCIENCE BOARD MEETING DATES AND MEETING NUMBERS, JANUARY 1970 TO NOVEMBER 1980

Meeting No.:	
129	Jan. 15–16, 1970.
130	Mar. 19–20, 1970.
131	May 21–22, 1970.
132	Sept. 3–4, 1970.
133	Nov. 19–20, 1970.
134	Dec. 17, 1970.
135	Jan. 21–22, 1971.
136	Feb. 18–19, 1971.
137	Mar. 17–19, 1971.
138	Apr. 15–16, 1971.
139	May 20–21, 1971.
140	July 15–16, 1971.
141	Sept. 9–10, 1971.
142	Oct. 14–15, 1971.
143	Nov. 18–19, 1971.
144	Jan. 20–21, 1972.
145	Mar. 16–17, 1972.
146	Apr. 20–21, 1972.
147	May 18, 1972.
148	June 15–16, 1972.

Meeting No.:	
149	Sept. 7–8, 1972.
150	Oct. 19–20, 1972.
151	Nov. 16–17, 1972.
152	Jan. 18–19, 1973.
153	Feb. 15–16, 1973.
154	Mar. 15–16, 1973.
155	Apr. 19–20, 1973.
156	May 17–18, 1973.
157	June 21–22, 1973.
158	Sept. 20–21, 1973.
159	Oct. 18–19, 1973.
160	Nov. 15–16, 1973.
161	Jan. 17–18, 1974.
162	Feb. 21–22, 1974.
163	Mar. 21–22, 1974.
164	May 16–17, 1974.
165	June 20–21, 1974.
166	Sept. 19–20, 1974.
167	Oct. 17–18, 1974.
168	Nov. 21–22, 1974.
169	Jan. 16–17, 1975.
170	Feb. 21, 1975.
171	Mar. 20–21, 1975.
172	Apr. 21, 1975.
173	May 15–16, 1975.
174	June 18–20, 1975.
175	Sept. 18–19, 1975.
176	Oct. 16–17, 1975.
177	Nov. 20–21, 1975.
178	Jan. 15–16, 1976.
179	Feb. 20, 1976.
180	Mar. 18–19, 1976.
181	May 20–21, 1976.
182	June 16–18, 1976.
183	Aug. 20, 1976.
184	Sept. 16–17, 1976.
185	Oct. 14–15, 1976.
186	Nov. 18–19, 1976.
187	Feb. 3–4, 1977.
188	Mar. 17–18, 1977.
189	Apr. 21–22, 1977.
190	May 19–20, 1977.
191	June 23–24, 1977.
192	Aug. 19, 1977.
193	Sept. 15–16, 1977.
194	Nov. 17–18, 1977.
195	Jan. 19–20, 1978.
196	Mar. 16–17, 1978.
197	Apr. 20–21, 1978.
198	May 18–19, 1978.
199	June 14–16, 1978.
200	Aug. 17–18, 1978.
201	Sept. 21–22, 1978.
202	Nov. 16–17, 1978.
203	Jan. 18–19, 1979.
204	Feb. 15–16, 1979.
205	Mar. 15–16, 1979.
206	May 17–18, 1979.
207	June 20–22, 1979.
208	Aug. 16–17, 1979.
209	Sept. 20–21, 1979.
210	Oct. 19, 1979.
211	Nov. 15–16, 1979.
212	Jan. 17–18, 1980.
213	Feb. 21–22, 1980.
214	Mar. 20–21, 1980.
215	Apr. 17–18, 1980.
216	May 15–16, 1980.
217	June 18–20, 1980.
218	Aug. 21–22, 1980.
219	Sept. 18–19, 1980.
220	Oct. 16–17, 1980.
221	Nov. 20–21, 1980.

MAJOR ISSUES OF POTENTIAL CONGRESSIONAL CONCERN

This study of the National Science Board was conducted to assist the Congress in its review and oversight of the operation of the National Science Board under the provisions of the National Science Foundation Act of 1950.

The study, which covers the period 1968–1980, has led to the identification of 13 Major Issues of Potential Congressional Concern. These Issues are discussed in greater detail in Chapter I. They are presented in summary form below with references to the page where the issue is discussed in the text of the report.

1. Broader Role For NSB?

The Board generally does not deal with those aspects of national policy which involve issues of using science and technology to meet social needs. Also it does not adjudicate scientific disputes. Its major, successful policymaking ventures have been limited to the area of "policy for science," and primarily to policies relating to basic research in NSF. Nevertheless, proposals have been made to give the Board a broader role. Since the Congress has already limited the Board's policymaking role to deal basically with issues affecting NSF, any consideration of broadening the Board's role in this area should look at the potential obstacles to such a role, especially the Board's lack of access to White House and OMB decisionmakers, the costs to NSF of becoming embroiled in political controversy, and the relative parochialism of the Board in relation to the kinds of constituencies and policy areas that probably should be represented on a national science policy Board. Based on these considerations, broadening the Board's responsibilities to include more "national science policy making" advisory functions might require amendment of the NSF organic act and, as a practical matter, changes in many Board functions. (p. 217)

2. NSB Role in Budget Process

Since the Board's role in budget-making for NSF ceases, for all practical purposes, once its recommendations are sent to OMB, should greater efforts be made to give the Board more authority in the defense of the budget before OMB and the Congress? Should Board budget decisions and recommendations be made public in order to strengthen the Board's visible role in budget-making and its role as an advocate of programs of national support for basic and applied science? (p. 180)

3. NSB Role in Basic Research

Since most Board members traditionally have been academic research scientists, the Board may not have the perspective and ability necessary to set policy for applied research and engineering and for pre-doctoral science education. (p. 243)

4. Attention to Science Education

Has NSB's traditional lack of attention to science education since 1968 contributed to weakening the Foundation's support for education? Does the recent reconstitution of an NSB science education subcommittee signify a new Board approach to education? (p. 301)

5. Relationship to Director's Advisory Council

Since there seems to be some overlap between subjects studied, research analysis methods, and support staff used between the Director's Advisory Council and the NSB, should formal steps be made to link the two? (p. 273)

6. Relationship to Advisory Committees

NSF advisory committees play the major role in developing priorities for NSF programs and divisions. NSB's control over and access to these committees has decreased since 1968. Should NSB assume some of the functions of these committees? Or does NSB serve as an effective balance to the scientific parochialism of the advisory committees? (p. 263)

7. Policy Role Versus Management Role

The Board spends a considerable amount of time in what might be considered actions of "micro-management." But many of the issues it deals with seem to have been already resolved by the Director, with the Board serving as a consensus-generating mechanism. The question is raised: can the Board cut back on the time it spends in these areas without jeopardizing obtaining the information it needs to conduct its budgetary and oversight responsibilties? Should the Board develop a list of criteria to determine which issues it will address in order to provide more time to develop long-range policy? The Board's major policymaking mode consists of reacting to issues, events, or policy and program decisions forced on NSF by the Director, the Congress and the OMB. (p. 127)

8. Programs Approval Function

NSF-generated data about the Board's program approval responsibilities are ambiguous. Many Board members indicate that program approval is a time consuming responsibility, even though the Programs Committee and the Board rarely alter the program award decisions made by the Director's Action Review Board. Perhaps the major effects of the Board's program approval responsibility is oversight and forcing an element of quality control on the NSF staff. However, can this objective be achieved some other way? Should the Board's statutory responsibility for programs' approval be modified so that policy issues, rather than dollar size of awards, are the major determinant of NSB involvement? Alternatively, would the Board be able to maintain its program approval functions at the same dollar level if the Foundation's budget is to increase significantly? (p. 116)

9. Program Review Practice

Is any effective Board oversight purpose served by the public program reviews now conducted for the Board by NSF support staff? (p. 31)

10. Board Members' Term of Service

Since absences at most Board meetings are caused by delays in nominating and confirming Board members after expiration of terms, should Congress permit Board membership to continue until successors are named? (p. 250)

11. NSB Annual Report

The Congress may want to consider revising the statutory requirement that NSB produce an annual report, given that criticisms have been raised about the lack of policy utility of such reports, that they take a long time to produce, and that Board members themselves want a change in the statute. The NSF Director, specifically, was entrusted with the two report responsibilities originally given to the Science Advisor. The Board plays virtually no role in producing these reports, but some members have criticized their quality. Since the requirements for Board and OSTP reports overlap to some extent, the Committee may wish to consider streamlining and coordinating these reporting requirements to save time and money as well as to utilize, to the greatest extent possible, the talents of a Board charged with national science policy functions. Such a revised requirement may well have the effect of forcing the Board to take a longer range perspective in its policymaking functions, which it tends not to do now. (p. 181)

12. Board Staff

The 1968 amendments to the NSF Act of 1950 enabled NSB to hire up to five professional staff to conduct its support work. With the exception of a few years in the mid-1970s when the Board had its own staff, it has not made full use of this provision. The NSB makes extensive use of NSF staff to support its work. As a result it has been accused of being a generator of needless paperwork. It has also received authority to hire staff at the members' own institutions to aid their work; and it has begun a pattern of using contractors to do some of its statutorily required analyses. Should the Board be required to hire staff in accordance with the statutory authority? Should be provision be dropped? (p. 84)

13. Compendium of Policy Statements

Attention might be given to several recommendations made in analyses of the Board since 1975 for the Board to collate and publish a compendium of its policy and procedural guidance as well as NSF staff responses to such policy to enhance congressional and Board oversight and to permit the Board to improve its priority-setting and long-range policy planning. (p. 192)

I. INTRODUCTION, SUMMARY, AND OVERVIEW OF ISSUES FOR POSSIBLE CONGRESSIONAL CONSIDERATION

As part of its examination of the need to revise the National Science Foundation (NSF) enabling legislation, the House Committee on Science and Technology asked the Congressional Research Service to prepare this report giving descriptive information and analysis on those aspects of the National Science Board (NSB) operations and activities most relevant to its examination of the Board, and relevant to possible modifications of the NSF organic act[1] with respect to NSB's organization and functions. This chapter summarizes the full report and synthesizes all policy issues raised in this study.

A. Sources of Information

The basic source of information used in this report consists of National Science Board files and minutes. NSB staff compile extensive background information prior to each Board meeting. Data and analysis are usually prepared by NSF staff on items listed on the agenda of the Board meeting. Minutes are kept of the open and closed sessions of the Board. Most of the important NSB business—discussions relating to approval of awards, personnel, Federal science policy efforts, other agencies budgets, initiatives dealing with NSB and NSF organization, and so on—is conducted in closed session. Minutes are kept also of each NSB committee meeting and some committees produce annual reports. The statutorily created Executive Committee also keeps minutes and produces an annual report. CRS utilized primarily open minutes in compiling this report, although in some cases use was made of closed minutes. However, in accord with NSB requirements, this report does not contain information relating to NSB discussions of pre-award researcher capabilities, qualifications of nominees for various posts, and current budget planning issues.

Interviews were held with several current and past Board members, NSF officials, and members of other Federal agencies, including: Dr. Norman Hackerman, Dr. Grover Murray, Dr. Marian Koshland, Dr. William Hubbard, Dr. Lewis Branscomb, Mr. Herbert Doan, Dr. Philip Handler, Dr. Richard Atkinson, Dr. George Pimentel, Dr. Donald Langenberg, Dr. Vaughn Blankenship, Dr. Robert Wright, Mr. Bruce Darling, Ms. Margaret Windus, Dr. Jack Sanderson, Mr. Charles Herz, Dr. Carlos Kruytbosch and Mr. Philip Smith, Office of Science and Technology Policy.

Considerable information, assistance, and guidance was provided by staff of the National Science Board Office, in particular Miss Vernice Anderson, executive secretary of the Board, and Mrs. Mary Parramore, special assistant to former NSB Chairman Norman Hackerman.

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[1] The National Science Foundation Act of 1950, Public Law 81–507, as amended.

We gratefully acknowledge the cooperation, courtesy, and assistance provided by all these individuals as well as other members of the NSB office, including Mrs. Jane Orr, Mrs. Laurel Donovan, Miss Sukari Smith, and Mrs. Joyce Hamaty.

B. Current Assessments of NSF

Although it is widely acknowledged that the National Science Foundation is one of the better-managed Federal agencies, there have been a number of discussions over the years about the need for another congressional review of the Foundation's charter and method of operations. There also has been considerable debate about the utility of the Board. Some detractors in the Office of Management and Budget allegedly have called for the Board's termination on the grounds that its functions are superfluous and that it is cost-ineffective.[2] Some NSF staff members have characterized the Board as a "nuisance" and a generator of a "needless paperwork burden."[3]

1. Self-generated Critiques of NSB

The NSB itself over the years has undertaken several evaluations of its activities. For instance, after the "Man: A Course of Study" (MACOS) program evaluation, which uncovered considerable mismanagement in science education funding procedures, NSB member Roger Heyns issued a statement calling for the Board to take its oversight responsibilities more seriously. Shortly thereafter, former NSF General Counsel William Hoff prepared a detailed critique of the Director/Board relationships. NSB itself established an internal self-study group and subsequently created a subcommittee of its Planning and Policy Committee to develop mechanisms to improve its communications links within and external to the Foundation.

2. Current Congressional Inquiry: Should the NSF Enabling Legislation Be Amended?

In 1979 the House Committee on Science and Technology reported that "It has been over ten years since the last thorough review of the NSF Organic Act was conducted. This Committee intends to begin another such review during the 96th Congress."[4] In explaining the need for this review, the Committee reasoned that the Act and the Foundation's many accumulated new functions were subject to different interpretations:

> Numerous competing trends, influences, or questions have developed as the Foundation and its various advisors exert their interpretations of what the Foundation does or sought to be doing.
>
> The accumulation of issues is reflected in the record number of committee views assembled. . . . While few of these individual issues, by themselves, place the details of the organic act in question, certain major trends or themes underlying many of the issues suggest that clarification, confirmation, or amendment of the charter may be desirable.

---

[2] Interview with a highly-placed NSF official, 1980.

[3] Interview with a highly-placed NSF official 1980.

[4] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Science Foundation. Report to Accompany H.R. 2729. House Report 96–61. 96th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1979, p. 21.

The Committee listed in greater detail some of the specific issues, which it said "... have roots that are deep in the basic definition of authority, responsibility and purpose of the Foundation, and so may be further illuminated if its charter is critically reviewed." These issues, according to the report, encompass primarily "... NSF roles in basic research, science education, applied research, ... [and] the fields of social science and public policies."

a. *Questions Relative to the National Science Board That the Committee Has Raised or That Are Addressed in This Report.*—The Committee held hearings on the issue of revising the organic act in September 1979 and January 1980. Witnesses were asked to respond to questions the Committee staff raised in a three page memo. Among the questions pertaining to the Board were the following:

> What are the communities that interact with NSF and who are the stakeholders involved with the governance of the Foundation?
>
> Who should be on, or represented by, the Board? Who is left out?
>
> How well has the past composition of the Board matched what is considered desirable?
>
> How has the role of the Board evolved over time?
>
> Should the current role of the Board be changed, particularly with regard to the relationship between the Board, the NSF Director and staff?

The basic thrusts of this inquiry relative to the Board are: Is the Board too involved with NSF management functions, that is micromanagement, so that it is prevented from fulfilling its responsibilities to establish NSF policy and other national policies for research and science education? What are the Board's precise responsibilities as a policymaking board for NSF? Can the NSB play a larger role in national science policymaking, that is, policies for science as well as policies regarding the use of science for furthering social goals? Does the burden of the NSB's oversight and program approval functions prevent it from fulfilling its policymaking responsibilities for NSF? Are NSB's policymaking functions sufficiently long-range to permit the Board to move the Foundation in the directions it wants?

Has NSB utilized the provision of the statute which enables it to hire a maximum of five professional staff to assist in its business?

Should NSB be required to report annually to the Congress, or should the Board instead be required to prepare a "science indicators" report annually, biennially or triennially, and other reports—of a substantive nature—on a timetable of its own choosing?

In view of the termination of the President's Science Advisory Committee and the President's Committee on Science and Technology, and considering the transfer of several national science policy functions from the Office of Science and Technology Policy to the National Science Foundation, should the National Science Board play a larger role in national science policymaking, or should it continue to devote its major efforts to the National Science Foundation?

b. *The Board's Response to the Committee's Questions: Revision of the Enabling Legislation Is Unnecessary.*—When announcing its oversight review, the Committee asked "... the Director of the National Science Foundation and the National Science Board to begin their own examination of the organic act". Subsequently the Foundation announced that its "... staff, under the direction of the Deputy Director, has started a review of the historical development of the Act in preparation for ... hearings. ..."[5] In addition, the Board established an Ad Hoc Committee on NSF Act Review, as well as a long-range planning activity discussion group to examine the issue.[6] The Ad Hoc Committee reported basically that the fundamental mission of NSF was support of "basic scientific understanding" and that the NSF Act as amended allowed adequate flexibility for NSF operations and therefore did not require revision. Specifically:

> Over time, this capacity of the Foundation for effective adaption to change is the prerequisite for the fulfillment of its mission. The striking changes in the scope, content, and size of thes Foundation's programs over the past ten years are interpreted by the committee as strong inferential evidence that the Organic Act has provided sufficient authorities for effective adaptative responses in the Foundation's programs.[7]

C. INTRODUCTION TO THE FUNCTIONS OF THE NATIONAL SCIENCE BOARD

The legislation creating the National Science Foundation, P.L. 81-507, signed by the President on May 10, 1950, specified that the Foundation would be an independent agency, consisting of a Board and a Director. In fact under the NSF Organic Act, the NSB and the Director together constitute the NSF. As a result NSF staff and NSB members often caution that conceptually and practically the Board should not be distinguished from the Director or the rest of the NSF. The 24 public members of the Board are nominated by the President and confirmed by the Senate. The Director is also a voting member of the Board. Board terms last for six years, and a member may not serve more than two consecutive terms.

1. *Formal Functions*

The NSB is unique since it is the only federally authorized scientific board with private members which has explicit functional responsibilities, as opposed to having only purely advisory functions (for instance, the Defense Science Board).

NSB's functions are like those of any corporate board.[8] It sets policy for NSF, issues annual reports, attempts to oversee management and ensure quality control via the establishment of procedures, and seeks to strike a balance between getting involved in details and making policy. The NSB differs from the typical corporate board in three important ways. The first two limit significantly the Board's authority. First, while the Board recommends candidates for the offices of Director, Deputy Director, and four of the six Assistant Directors, only the President has the authority to appoint and dismiss these officials. However, the President generally adopts NSB's recommendations for replacements of its own members. Only about six of 110 NSB members have not been among Board nominees. Second, while the Board shares authority with the Director and staff in formulating budgets (a function which the Board only recently began to control), forces external to the NSF (that is, the Office of Management and Budget, the President, and the Congress) are the ultimate arbiters of NSF's budget. Congress retains the ability to shift priorities as well as to control the inception and termination of programs. The Board's role and influence in budget-making is usually attenuated after the budget has been sent to OMB. Third, the NSB has a statutorily authorized function which also signifies its difference from most corporate boards: it shares decision-making authority with the Director on some major discrete operations: it is required to approve all new NSF support programs as well as all awards which exceed $500,000 annually or $2 million in total. The Act, as amended, also assigns a national science policymaking role to the Board.

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[5] National Science Board. Memorandum to Members of Ad Hoc Committee on NSF Review Act. Apr. 20, 1979. (NSB/C-79-21.)

[6] Report of Discussion Group 79-B on Topics Related to Review of the NSF Organic Act as received by the National Science Board At Its 207th Meeting. June 22, 1979. (NSB 79-279. Appendix E. Attached to NSB 79-244) and National Science Board. Memorandum to Chairman. National Science Board. Subject: Report of the Ad Hoc Committee on NSF Act Review. Nov. 23, 1979. Appendix C (Attached to NSB-79-465.) See also National Science Foundation and the Support of Research and Science Education in the 1980's. Policy Statement Unanimously Adopted by the National Science Board at Its 202 Meeting on Nov. 16-17, 1978.

[7] Dr. Norman Hackerman in testimony before the Committee on Science and Technology. Jan. 30, 1980. quoting from a report by Dr. William Hubbard, chairman of the Ad Hoc Committee on NSF Act Review.

[8] See, for example, Palmieri, Victor H. Corporate Responsibility and the Competent Board. Harvard Business Review. May-June 1979: 46-48.

The implications of some of these NSB activities are understood better when related to the Foundation's finances. In terms of finances, the Foundation's responsibilities have multiplied by a factor of over 300 since the Foundation began operations (from an appropriation of $3.5 million in the fiscal year 1952, NSF's first full year of operation, to a budget request of $1.1 billion in the fiscal year 1981). The NSF organic act underwent its first extensive revision in 1968 when the Congress passed and the President signed P.L. 90–407 on July 18, 1968. At that time the Foundation's budget was about $400 million—indicating that the NSF budget has almost tripled (in current dollars) in the 12-year interval since the Congress last undertook an intensive examination of NSF activities.

NSF functional responsibilities also have increased enormously. With the 1968 revision, the Foundation was given explicit authority for programs in applied research, social sciences, and international science. The Foundation's management capabilities were revised and strengthened, the Board was required to report annually to the Congress on policy issues relevant to the NSF, or with which the Board was concerned, and the Foundation's budget was made subject to annual authorization. Since 1968, the Foundation has begun at least 40 new programs in diverse areas and at least an equal number of administrative, policy, or procedural actions, most of which were initiated by the Congress and the Office of Management and Budget, and all of which required NSB approval.[9]

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[9] NSF Program Flexibility. Appendix I of: National Science Board. Memorandum to Chairman, National Science Board. Subject: Report of the Ad Hoc Committee on NSF Act Review, November 23, 1979. Appendix C (Attached to NSB–79–465), CS:211:39–CS:211:42. Also: Memorandum to Members of the NSB. Subject: Biennial Business—Review of Delegations of Authority from the Board to the Director and/or the Executive Committee, May 19, 1976 (NSB–76–165), Memorandum to Members of the NSB, Subject; Biennial Reviews of Delegations of Authority to Director and/or Executive Committee, May 11, 1978 (NSB–78–217), and Memorandum to Members of the National Science Board, Subject: Biennial Review of Delegations of Authority to Director and/or Executive Committee (NSB 80–198).

2. *Informal Functions*

Most would agree that the Board's unique contributions to NSF consist not only of its formally defined functions, but also in the long-term effects of Board policies on NSF and on the maintenance of the delicate balance of "shared authority" between the President, the Director, and the Nation's scientific community (represented by the Board)—a balance which preserves Federal control while at the same time enabling scientists themselves to determine priorities for federally funded basic scientific research. The NSB usually agrees with decisions the Director brings to the Board—but only after an iterative process in which the views of the Board members—representing various areas of science—are heard. The NSB, therefore, serves as a consensus generating body—a body which reconciles the independence of science with public demand for accountability in determining priorities for Federal research expenditures. Dr. Philip Handler, former NSB chairman, and until mid-1981 President of the National Academy of Sciences, encapsulated this view in testimony before the House Committee on Science and Technology. One of the Board's major functions, Handler said, was to maintain the integrity of NSF, including ensuring that senior officials are not chosen for partisan political reasons, keeping staff accountable to the external scientific community, and ensuring the objectivity of the peer review process.[10] It also lends prestige to and depoliticizes the agency, which, because of its function of distributing research funds, could become the captive of special ininterest groups within and outside science, even NSF advisory committees or program managers. The Board, composed of prestigious scientists representative of major disciplines, serves, some say, as an effective counterbalance or "leveler" to such a potential threat since it brings a national perspective to bear. An important "informal" function of the NSB, according to Handler, is to "shield the director and his staff from furious gusts in the winds of political change." [11]

Some also report that the existence of the Board tends to make the Director's job easier, since it is wise for the Director to obtain Board approval before undertaking a controversial course of action—either within the Foundation, such as priority-setting among directorates, or involving OMB, Congress, or the President. The legitimacy afforded a decision supported by 24 eminent scientific statesmen cannot be easily challenged.

The one NSB function remaining to be described is undoubtedly the most important: That is, quality control. Although the reporting and analysis requirements that the Board imposes on the Director and staff in the conduct of NSF business are stringent, it seems likely that NSF staff operations and the quality of federally sponsored research are enhanced merely because of the existence of the Board. The potential for oversight by NSB of any NSF staff action likely causes decision papers to be better prepared and documented. Thus, merely by virtue of its presence, the Board seems to perform a quality control function that is missing from other Federal agencies which do not have boards of such eminence and authority.

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[10] There is probably widespread concurrence with a statement made by Dr. Roger W. Heyns in an editorial in a recent issue of *Science:* "The record shows that NSF is one of the nation's most effective government agencies, untouched by major fiscal scandals, singularly free from political uses, and highly regarded by the vast majority of the scientists, engineers, and educators who have had to deal with it. Its awards are generally perceived to be honestly and wisely made." (Heyns, Roger W. National Science Foundation Hearings. Science, v. 206, Dec. 14, 1979: editorial.)

[11] Handler, Philip. Testimony before the House Committee on Science and Technology, May 1979, p. 24.

D. EVOLUTION OF THE NATIONAL SCIENCE BOARD, 1950–1968

1. The National Science Foundation Act of 1950

The National Science Board was created in 1950 through the National Science Foundation Act of 1950 as an integral part of the National Science Foundation. The Board's present structure and authority has its roots in an extensive period of policy debate regarding an appropriate Federal Government peacetime role in funding science and technology which took place during and immediately following World War II. This debate took place after the success of the Manhattan Project which led to development of the atomic bomb, a vital factor in terminating the war against Japan. The legacy of this event was the belief that Government should support an activity which would permit the generation and use of basic research for social purposes.

The NSF Act of 1950 created a National Science Foundation consisting of a 24-member National Science Board and a Director as ex officio member of the Board. The structure of the Board and the division of "shared authority" between the Board and the Director created by the NSF Act were the outcome of compromises over several vigorously debated issues focusing on: (1) the proper form of Federal support for scientific research and education; (2) the need for successful scientific research to be managed by scientists with the greatest possible amount of autonomy from Government; (3) the need for Federal expenditures to be managed by executive officials accountable to the President; and (4) the nature of the Board's role to represent scientific disciplines, society as a whole, and geographic regions. The resulting Board was designated as the policy-formulating body of the Foundation. The Act specified that the Board shall consist of eminent persons from fields of the basic sciences, medical science, engineering, agriculture, education or public affairs, selected to "provide representation of the views of the scientific leaders of the Nation." In practice the overwhelming majority of Board members have been academic scientists and administrators. The Board was also given the responsibility of reviewing and approving all grants and other arrangements relating to the Foundation's scientific activities.

2. The Primacy of NSF's Mission to Support Basic Research

The purpose of NSF as stated in its enabling legislation is primarily "to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels in the . . . sciences . . . to support such scientific and educatonal activities and to appraise the impact of research upon industrial development and upon the general welfare. . . ."

The primacy of the basic research mission continues to characterize the NSF today despite the legislative expansion of the agency's mandate in 1968 giving it explicit authority to support applied research and social science and the 1972 legislative expansion to emphasize the coequal responsibility for science education (P.L. 90–407, July 18,

1968) However, the objective of maintaining the Federal support for funding for basic research in academic settings pervades most of NSB today—the character of its membership, its funding priorities, the nature of its procurement related policy activities, and the bulk of its policy statements.

3. *Other Aspects of 1968 Amendment of the NSF Enabling Legislation*

The 1968 amendment also required that an annual report be prepared by the Board on the health and status of science and its various disciplines. It also restricted the Board's authority to delegate its awards approval responsibility for grants for scientific research to the Director for awards involving amounts greater than specified dollar limits. In addition, the 1968 amendment authorized the Foundation to support applied research activities, but not to the detriment of basic research.

4. *1968 Amendment and Subsequent Actions Open the Way for Enhanced Congressional Direction of NSF*

The 1968 Amendment also opened the way for significant congressional control over NSF and, therefore, attenuation of the NSB role. It required appropriations to be authorized annually for NSF. This led shortly thereafter to a congressional decision to require line-item budgeting in NSF, with the Director allowed to modify authorized funding only within a limit of 10 percent of authorized funding. Since then Congress has issued detailed instructions to NSF, via legislation and congressional reports, for programmatic, reporting, and administrative actions. President Jimmy Carter called these detailed legislative funding specifications and "report language" ". . . an incursion on executive management responsibility" when he signed the fiscal year 1981 NSF authorization act, and reminded ". . . the Director of the National Science Foundation that committee reports are not law and should not be treated as though they were." [11a]

E. NSB RESPONSIBILITIES AND PROCEDURES

Board activities consume the equivalent of about one month per year. The Board generally meets for two and one-half days per month about nine to ten times a year. Members are paid at the daily salary rate for GS–18 civil servants. Normally two-thirds of each meeting is devoted to committee meetings. The Board holds three special kinds of meetings each year: an annual meeting in May to name officers, review committee structure and so on; an annual, substantive, long-range planning meeting held in June, generally at an NSF-funded site or research center; and a budget, long-range planning meeting during which Assistant Directors present their budget arguments to the Board.

For three reasons the NSF Director plays a crucial role in determining the agenda of Board meetings: he is the chairman of the Executive Committee which is responsible for setting the NSB's agenda, he is the chief administrator of the agency being governed, and it is basically his staff which controls the data and background information given to the Board.

[11a] U.S. President Jimmy Carter. National Science Foundation Authorization and Science and Technology Equal Opportunities Act. Statement on Signing S. 568 Into Law. December 12, 1980. Weekly Compilation of Presidential Documents, v. 16, Dec. 15, 1980: 2804–2805.

1. A Typical Board Meeting[12]

Board meetings typically follow a fixed format. Important recurring items in most plenary sessions include:

1. Status reports on Board annual reports;
2. Reports of the professional activities of members;
3. Adoption of resolutions of honor, that is, naming a scientific discovery for a scientist and selection of recipients of honorary awards;
4. An extensive report by the NSF Director, giving: lists of all awards acted upon or declined since the last meeting; discussion of the Foundation's most important personnel and organizational changes; discussion of relevant congressional action; status report on budget activities (the Board is acting simultaneously on three budgets); review of NSF activities undertaken in response to congressional and executive direction; discussion of trips made by senior NSF staff; identification of significant meetings and discussions with members of the scientific communities; recent public critiques of NSF or programs; discussion of administrative actions affecting NSF employees, such as flexitime; program reviews; reports on special studies that staff are undertaking at the request of NSB, such as of the "young investigator" issue;
5. Detailed reports on the status of activities by NSB committee chairs;
6. Presentations by science officials of other agencies;
7. Reports by NSB members of attendance at meetings of advisory committees or the Advisory Council;
8. Reports by NSB members on site reviews;
9. Presentation, discussion, and vote on awards requiring NSB approval (only interagency transfer of funds are discussed in open session);
10. Requests for Proposal, program announcements, and other matters, and
11. Public reviews of some major NSF program activities.

Issues for Consideration

Serious consideration might be given to streamlining some of the Board's agenda so that it spends less time dealing with administrative details, while at the same time establishing procedures to ensure that policies and procedures are being well implemented.

F. INDICATORS OF WORKLOAD INCREASE[13]

Several indicators reflect significant increases in the NSB workload since 1968. The number of Board meetings has climbed dramatically. In the fiscal year 1967 the Board met five times. Since the fiscal year 1971, the Board has held eight or nine meetings per year. In 1980 the Board met ten times.

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[12] Based on Chapter III and appendix A.
[13] Based on Chapter III.

Another measure of increase is the almost straight-line trend in the number of documents sent to NSB members by the NSB executive secretariat. In 1966 Board members were sent 244 full Board items. This more than doubled by 1979, to 492. Whereas in 1970 a total of 384 other items were sent to NSB members, in 1979 a total of 869 other items were sent. The Board's budget expenditures, for travel and compensation exclusive of funds spent to contract for NSB annual reports, also have increased, by about one third in real dollar terms, from a total of $100,732 in 1970 to $285,000 estimated in the fiscal year 1982.

The Board's "management/oversight" and administrative functions consume considerable time even though the Board rarely alters a decision the Director brings to it. NSB seems to be involved, one way or another, in all major policy, management/organizational changes major activity, and major meeting in NSF. These functions include such things as initiation of flextime for NSF staff, selection of publishers for curriculum materials, retirements of senior personnel, adoption of new grant mechanisms, and policy regarding scientific exchanges with the Soviet Union.

NSB does not usually suggest the topics for most policy deliberations; yet it seems to be notified about, involved in, or concerned with almost every decision the Director makes.

Issues for Consideration

The questions can be raised: Should and can NSB be involved in all these activities? Do all activities involve policy? Or does the Board's oversight responsibility require it to familiarize itself with all these details?

Should better criteria to determine workload priorities be established to free time for the Board to deal with critical matters? New Board Chairman Branscomb instituted several procedures to trim the Board's workload, specifically to require Board members to present only written, not verbal, reports to the Chairman on meetings attended. Similar attention might be given to streamlining Board agendas to determine an adequate balance between dealing directly with administrative and other details and developing policy to oversee these activitives.

G. Attendance at Board Meetings

Board attendance often is significantly less than 100 percent of the statutorily authorized level of 24 members and the Director. From 1969 to 1980, in about one-third of all meetings held each year, only two-thirds of the members were in attendance. A majority, computed on the basis of the authorized number of 24 members, was not present four times, twice in 1976, once in 1979, and once in 1980. However, most gaps are caused by lack of timely confirmation of new Board members, who in most cases were present as non-voting consultants in Board meetings. There were eight vacancies during parts of 1979 and parts of 1980.

H. Staffing

The 1968 NSF Act gave NSB the authority to utilize up to five professional staff for full-time NSB functions. The NSB has tended not to utilize this provision. In the last few years only the Executive Secretary and Chairman Hackerman's special assistant have filled these positions. In the mid-1970s, after the NSB Planning and Policy Committee undertook a special "self-study," the Board passed a resolution to utilize the statutory provision. The Board's decision to seek its own staff was aided by congressional action which raised the maximum status of staff from GS–15 to GS–18. It hired three professionals from the NSF staff to serve as executive secretaries for some of the NSB and to manage the preparation of annual reports. These three staff members also served for a time as executive secretaries of other Board committees. Within the next 18 months to two years, these staff members were reassigned back into the Foundation, after the Board concluded that this arrangement had been unsatisfactory and that, instead of hiring its own staff, it should utilize NSF staff members. The arguments made against having full-time scientific staff for the Board are persuasive: deliberate separation of NSB and NSF staff causes communications gaps, instills a "we" versus "they" attitude preventing the Board from obtaining all the information and full insight into NSF operations that would be afforded by using NSF staff part-time; NSB staff are shortchanged since they encounter obstacles when they try to reassume responsibility for managing the Foundation's disciplinary support programs. Now most NSB staffing is provided by staff members of the NSF Office of Planning and Resources Management, which was established by the Director to provide him and the Board with staff support for matters of policy, budget, and management.

Recently the National Science Board adopted a resolution, resulting in Federal regulations published in the *Federal Register*, to permit NSB members to hire and pay for staff support at their home institutions to assist in performing Board functions.[14]

Issues for Consideration

It may be necessary to assess the need to modify the statutory language relating to NSB staff since the current statutory provisions are not being used to the fullest, and the Board generally follows the alternative arrangements of using NSF staff members and has adopted a procedure allowing the hiring of staff at their home institutions.

I. Board Rules on Conflict of Interest

The Board has adopted an elaborate series of rules to govern members' behavior, especially to avoid conflicts of interest.

Board membership lagged initially after the adoption of the Ethics in Government Act, since some nominees did not want to be forced to disclose their financial worth to the public. The Board was successful in obtaining an exemption from this regulation.

J. Director/Board Relationships

The Director plays a crucial role in determining NSB's workload. This occurs by virtue of his chairmanship of the NSB Executive Committee, which is responsible for setting the NSB agenda, and because the Director's staff also staffs the Board. In addition, there are some subtle facets of the delicately balanced Board/Director relationship which often give the Director special influence.

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[14] Proposed Regulations Exempting Board Members From Certain Financial Conflicts of Interest, NSB/Res. 79–27 (205 : 13).

Of importance is the issue of the interaction between the Board and the Director's own "kitchen cabinet," composed of senior NSF staff members. During 1970 the Director took two actions to consolidate his power. In May he established an Executive Council to serve as key advisor in planning, policy, and program development. The Executive Council seems to be especially powerful, since while meetings of the Executive Committee of the Board are closed even to most Board staff members, some NSF staff members, who are also members of the Executive Council, attend meetings of the NSB Executive Committee. The General Counsel and the Deputy Director, who are members of the Executive Council often attend NSB Executive Committee meetings. A few months later, the Director took the second action by establishing a Management Council, to "serve as a mechanism for improving staff communications, review problems of more than one directorate, and initiate staff work to clarify issues."

The Director's ability to influence the NSB workload is further defined by the fact that he has management control over the flow of information to the Board. But several Board members and NSF staff have indicated that the Board members and the senior NSF staff have many informal relationships and discussions which are not reflected in the formal Board minutes.

Apparently the amount and type of interaction between the Board and the Director varies with the personalities and styles of Director and Board Chairman as well as the Chairman's political and practical needs to be responsive to the influence exerted by the White House staff. According to Dr. Grover Murray, immediate past Vice Chairman of the Board:

> [Dr. Hackerman and I] have served with four of the five directors, who are . . . ex officio Members of the Board. Each director has played a significant, but different role vis a vis the Board. It has been my experience that the relationships between the Board and the respective directors have been very good. They appear to be especially close with the incumbent, Dr. Richard Atkinson, whom we consider to be an outstanding chief executive officer of the Foundation.[15]

Some Directors as well as Board members have gone as far as to characterize the Director/Board relationship as a collegial one on the grounds that the Foundation consists of the Board and Director, officials who are co-equal in their origins and terms of employment (that is, not professional bureaucrats). Others attribute the characteristics of collegiality to the meshing of functions: the Board helps the Director cope with program managers who individually may view themselves as "czars" of their particular areas of science support. NSB serves, therefore, as a "balance wheel" among scientific disciplines.[16]

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[15] U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science Research, and Technology. 1981 National Science Foundation Authorization. Hearings 96th Congress, 2nd session on H.R. 2728. February 1980, Washington, U.S. Govt. Print. Off. 1980, p. 45.

[16] Interview with NSB official, 1980.

Nevertheless, the record indicates that personality differences are salient. As Board Chairman, Dr. Handler, generally acknowledged to have had an authoritative personality, talked daily with the then NSF Director, Dr. Leland Haworth. Dr. Handler said he gave Dr. Haworth the political guidance that he lacked. On the other hand, Dr. McElroy is considered to have often acted independently of the Board. Dr. Stever acted independently of the Board to the extent that it was required by his dual roles as NSF Director and President Nixon's science advisor. Dr. Hackerman, immediate predecessor to the current Board Chairman Dr. Branscomb, appears to have been an activist who made notable management changes in the Board's procedures. However, he and Dr. Atkinson apparently got along quite harmoniously. They spoke on the telephone approximately once per week, except during periods of congressional budget action, when they often spoke daily. Also, Dr. Hackerman is reported to have interacted quite closely with the NSB executive secretary who interacted daily with the Director. (See Table 1 for an overview of NSF leadership.)

TABLE 1.—*Periods of Service of NSF Director and NSB Chairman*

NSF Director	*NSB Chairman*
William D. McElroy, July 1969 to January 1972.	Philip Handler, May 1966 to May 1970. H. E. Carter, May 1970 to May 1974.
H. Guyford Stever, February 1972 to August 1976.	Norman Hackerman, May 1974 to May 1980.
Richard Atkinson (acting: August 1976 to May 1977), May 1977 to June 1980.	Lewis M. Branscomb, May 1980 to present.
Donald Langenberg (acting: June 1980 to December 1980).	
John B. Slaughter, December 1980 to present.	

The Board's access to the White House and its control over the Director's interaction with the White House usually has been constrained. The White House science advisory apparatus and the OMB are natural barriers to direct NSB interaction with the President. In addition, an important reason is that the two report-writing functions transferred to NSF from the Office of Science and Technology Policy (OSTP), pursuant to Reorganization Plan No. 1 of 1977, transferred these functions to the Director, not to the Foundation. In fact, the Directorate for Scientific, Technological and International Affairs was established in part to provide analytical support to the OSTP.[17]

As a result of his initiation of policy-related actions and reconstitution of a national science policy subcommittee, called the Ad Hoc Subcommittee on NSB and National Science and Technology Policy Issues, it is expected that Dr. Branscomb will be a forceful Board Chairman and will attempt to create better conditions for more interaction with White House decisionmakers.[18]

The Board's control over the Director is further limited since the Board does not have ultimate authority over the naming of members of Advisory Committees or over personnel matters. In practice the Board suggests candidates to the White House for Director, Deputy

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[17] See chapter X.
[18] Interview with NSF official, 1980.

Director and the four presidentially named Assistant Directors. Usually the list which the Board forwards is sent by the Director (including the names for the post of new Director). The Board customarily agrees with the Director's list and the White House customarily concurs with the list sent over. There was one notable instance where the White House did not. This was the White House opposition to naming Franklin Long Director on the grounds of his opposition to President Nixon's deployment of the Anti-Ballistic Missile (ABM) system. Subsequently, after an outcry from the scientific community, President Nixon wrote a letter of apology to the Board and proposed to nominate Long, who, however, declined.

K. Executive Committee

Like most boards, NSB has established a committee structure to aid its deliberations and to prepare draft decisions for board approval. (See table 2 for a list of committee abbreviations.)

Table 2.—*Abbreviations for Major NSB Committees*

COB: Committee on the Budget.
PPC: Planning and Policy Committee.
EC: Executive Committee.
PC: Programs Committee.

The Executive Committee (EC) was created pursuant to statute. It is composed of the Director, and four additional Board elected NSB members of whom, in practice, two are always the Board Chairman and Vice Chairman. The Director chairs the EC. Originally the EC was created basically to constitute a group to act on behalf of the Board between meetings. Subsequently it was given the added functions of approving affiliations of the senior staff, of providing the first line of review for staff and Board nominees, of coordinating and offering guidance on activities of the Board and its committees, of serving as an agenda committee, and of identifying tasks for additional Board action.

During the period 1969 through 1971, the Executive Committee met when the Board did not. But beginning in 1971 and continuing to the present, the EC has tended to meet at the same time as the Board, usually the evening before.

The EC also has another function—that of serving as a sounding board for the Director. This may explain why the EC finds it necessary to meet right before the full Board does, but a comparison of minutes indicates some overlap in discussions. This may raise questions about the need to define the EC responsibilities more precisely.

The statutory language requires the EC to prepare an annual report. As is done for other committees and the full Board, minutes are kept of the EC deliberations. The annual report that is prepared is not an analytical document, but instead, is a listing summarizing an activity described in the minutes in one or two lines. Thus, in order to trace EC deliberations on an activity, one has to search through the chronological listings in each annual report. The annual reports carry a privileged document label. But even with this qualification, the information contained in the annual reports is not a complete rendition of the discussions that occurred in the Executive Committee, which are often candid critiques, whose essence is expurgated in the annual reports.

At least two recent proposals have been made to give the Executive Committee more authority: one made by former General Counsel Hoff in 1976 which would have strengthened the EC and its staff at the same time, and would have given the EC most of the full NSB functions other than policymaking, on which the Board, purportedly, would have more time to concentrate. The other proposal, made by former NSF Deputy Director John T. Wilson, in testimony before the House Committee on Science and Technology in 1979, was cut the size of the Board back to seven or eight members, make the Board a full-time, temporary job, where Board members serve, in effect, as NSF Assistant Directors. Neither of these solutions would seem to coincide with what is typically characterized as good practices of "board management," nor with the Board's expressed preference to be given access to considerable detail to enable it to fulfill the oversight functions it perceives as crucial.[19]

Issues for Consideration

Attention seems required to deal with the need for clarifying the functions of the Executive Committee without jeopardizing the delicate balance between the Board and the Director.

The Congress may wish to inquire if the Board is fully complying with the statutory requirement regarding the preparation of Executive Committee annual reports to determine whether they serve a real function or whether they are superfluous. The Congress may wish to reevaluate the functions of the EC.

L. NSB COMMITTEE STRUCTURE

Except for the Executive Committee, which is a statutory committee, the NSB and its Chairman establish the Board committees and make appointments to them at each May meeting. In the early and mid-1970s ad hoc committees and subcommittees seemed to proliferate. The committee structure began to be streamlined in 1976, under Board Chairman Hackerman, who sought to improve Board management. When he became Chairman in 1980, Dr. Branscomb further streamlined the committee structure. As a result, the NSB has created a more or less permanent committee structure with standing and task committees. Previously, the NSB had a proliferation of ad hoc committees which the NSB had customarily created as a reaction to a particular situation or external events, for instance, the Committee on Big and Little Science and the Ad Hoc Committee on Ocean Margin Drilling (both created in response to congressional action). Some of the task committees were made Subcommittees of the Planning and Policy Committee.

A notable feature over time has been the staff support provided to NSB committees by NSF staff. Most NSF staff support comes from the Office of Planning and Resources Management and the staff of Special Assistant to the Director. During the mid-1970s, when the Board had its own staff, Board staff served as executive secretaries of major committees.

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[19] Sec, for example, Palmieri, Victor H. Corporate Responsibility and the Competent Board. Harvard Business Review, v. 57, May-June 1979: 46–48.

M. MEMBERSHIP OF THE NATIONAL SCIENCE BOARD

1. General Trends

The members of the National Science Board are appointed by the President, by and with the advice and consent of the Senate, to serve staggered six-year terms of service, eight of which expire each even year. Vacancies are filled by the President after giving consideration to recommendations submitted by scientific, engineering, and educational associations. Usually the President adopts the Board's suggested nomination list. The NSF Act also requires that Board members be geographically distributed throughout the Nation. However, the representation of Board members has been skewed toward a higher proportion from the Northeast and a lower proportion from the South and West.

There have been 15 major vacancies on the Board lasting approximately one year each (one lasted about two years). Ten of these were caused by delays in the President's appointment and Senate confirmation of Board members. These delays have made it difficult for the Board to carry out its functions. In order to maintain as full a complement of NSB members as possible, the NSB adopted procedures to permit as-yet unconfirmed, as well as former, NSB members to attend meetings as non-voting members. Recently the Board sought a legislative amendment to permit memberships to continue until successors were named. This was not enacted.

Generally, Board membership has included one or two racial or ethnic minority members and one or two women. During the period May 1978–May 1980, the Board included three women, three blacks (including one black woman), and one Hispanic.

Although the NSF Act requires members to represent all scientific discplines, the chief affiliation of most Board members has been academic and most heavily concentrated in the mathematical and physical sciences. Social sciences have not been heavily represented. University administrators have been represented in substantial numbers among NSB members.

Issue for Consideration

The question can be raised: are members parochial in their representational roles, or do they represent a broader science perspective when assuming Board membership?

2. Distinguished Individual Members

The Board is a prestigious group. NSB members generally have other extensive advisory responsibilities in universities, industry, and professional associations which serve to promote a broad policy perspective. Of the appointed members serving on the National Science Board between 1970 and 1980, approximately half served on from one to four other science-related Federal boards, councils, or advisory bodies during their tenure on NSB. Three have been Nobel Laureates; three former NSB members have become presidential science advisors: Drs. Press, Stever, and Dubridge. Three members have served as President of the National Academy of Sciences: Drs. Bronk, Handler, and Press. One served as a cabinet member: Secretary of Agriculture Clifford Hardin. Others have served as university presidents and officials of scientific associations.

Some individual members have made notable contributions to Board deliberations or NSF activities. It is generally conceded that only 10 to 15 of the 24 Board members are active in a policy formulating sense. Some of the individual initiatives of note are:

Mr. Doan: instrumental in initiating Foundation analysis and activities relating to university/industry research;

Dr. Cobb: a leader in activities to broaden Board membership and Foundation activities on behalf of minorities, women, and international activities;

Dr. Heyns: suggested the *Science Indicators* report series;

Dr. Koshland and Dr. Hubbard: instrumental in improving the NSB long-range planning and budgeting improvement activities;

Dr. Hubbard: a critical factor in improving Policy and Planning Committee functions;

Dr. Mac Lane: a scrupulous critic of social statistics, science indicators, and all NSB and NSF report activities;

Dr. Hackerman: instrumental in improving the Board's recent organization and management;

Drs. Thieme, Heyns and Hesburg: among the few NSB members who were ardent supporters of social sciences; and

Dr. Branscomb: instrumental in trying to improve the Board's ability to do "national science policy-making." [20]

3. Congressional Calls to Widen Membership

There have been a number of proposals, emanating most persistently from the Senate, calling upon the President and the Board (who suggest their own replacements) to widen the basis of geographic distribution of members, to add more women and minorities, and especially to add more representatives of small colleges and pre-college science educators to the Board. While these calls have been met to a small degree, the Board has adopted the position that it should represent that portion of society which is its major constituency—basic researchers at academic institutions.

4. NSF Advisory Council

The NSB opposed widening the membership of the Board to avoid what it presumed would be a sacrifice of quality. But in response to congressional pressures to enlarge NSF's interaction with the public, as enunciated in the Senate report on the fiscal year 1977 authorization bill (Senate Reports 94–888 and P.L. 94–471), the Foundation established in 1976 an Advisory Council to the Director, composed of 24 members, at least six of whom are public members. The Director names members who are responsible only to him. While the Council is intended to provide greater representation for the public, its first chairman was Dr. Donald Langenberg, a university scientist, who became the NSF Deputy Director in 1980. In the manner of the Board, the Council has divided itself into task groups to study and prepare reports on important issues cutting across the fields of science and the Foundation's responsibilities. Its current tasks are: (1) continuing education for engineers and computer professionals in universities and industry, (2) the role of NSF in science education of the public, and (3) the role of "rotators" (temporary NSF program managers from academia) in NSF.

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[20] Based upon reading NSB minutes.

Although the Council is advisory to the Director, its functions seem to overlap the NSB's policymaking responsibilities to some extent. Board minutes indicate that a few Board members have attended some Advisory Council meetings and that the Board has occasionally made reference to Advisory Council reports. But it is difficult to determine whether or or not these reports have had an effect on Board deliberations.

Issues for Consideration

The question can be raised: would NSB policymaking be enhanced if there were more cross-fertilization between the Board and the Council?

5. Other Public Participation Efforts: Regional Forums

The 1977 legislation required the NSF to establish a means to obtain public opinion about its priorities. As a result, the Foundation suggested, and the Board agreed, that a series of regional forums be held. After several forums were held, the Board became dissatisfied with the quality of information obtained in relation to the effort required. It adopted a resolution which commended the forums as an admirable experiment, but recommended that they be cut back to one per year and that staff experiments with other mechanisms to see if they could be used to achieve the same objectives.

Issues for Consideration

Vacancies on the Board due to delays in the nomination and Senate confirmation process have interfered with Board activities in the past. Should the NSF enabling legislation be changed to allow or require that, upon normal expiration, Board members' terms of service be extended until Senate confirmation of replacements occurs?

The NSB may believe that congressional insistence upon adequate representation of geographic areas and minorities compromises representation of quality science. Does the Advisory Council serve adequately to represent the public?

The NSB may lack sufficient representation of researchers representing industry, applied science, undergraduate education, and small colleges. To what extent does this inhibit the NSB from drawing upon appropriate resources in developing programs in these areas?

N. THE PLANNING AND POLICY COMMITTEE

The Planning and Policy Committee (PPC) is the Board's principal policymaking and long-range planning committee. Most of its activities deal with governance of the NSF and other "policy for science", primarily NSF-related and basic science issues, rather than broader national "science for policy" issues, that is, the use of science to solve social problems or to adjudicate differences in scientific fact.

The PPC has always been chaired by the most national science-policy oriented, and active members of the Board. Its policymaking activities often result in the formation of PPC subcommittees or task groups to study an issue in more detail, or in the issuance of Board-adopted policy statements, resolutions, and letters.

At its regularly scheduled monthly meetings, the PPC deals with NSF policy issues. It also manages the Board's annual, long-range planning meeting.

The Director's influence on the PPC regular work is ensured by the fact that most of the extensive background work done for the PPC is done by high-level NSF staff and because the Director brings to the PPC most of the tasks it works on. Most of the PPC work deals with issues of science infrastructure or science support mechanisms that the Director brings to the Board's attention. Often political factors seem to constrain the choice of issues the Director brings to the Board, as in the case of OMB Circular A-21, dealing in part with time and effort reporting by researchers, which the Director at first refused to view as a problem in the same terms the Board perceived. But there are several notable cases where the PPC or the Board has taken the initiative in enunciating policies, or in suggesting policies with which the Director disagreed. One is the Board's policy decision to oversee closely the NSF Office on Audit and Oversight and to establish other oversight procedures, to require complete peer reviews to be sent to Programs Committee members and to send verbatim peer review comments to principal investigators. Another was the Board's opposition to supporting basic researchers in industry despite NSF wishes to the contrary. The PPC also acted to ensure oversight of planning of the RANN program even though OMB had thrust it upon the Foundation. The PPC's general lack of policy initiation is significant only if it is agreed that the Board should have a more active role independent of the Director in initiating policies. Shaping policy whose needs the Director and staff have enunciated is often as compelling as initiating policy. Another important positive effect of PPC activities is that its data and analysis force some discipline and forward thinking on the staff.

1. PPC Long-range Planning Activities

The PPC manages, every June, a substantive long-range planning meeting, to give in-depth attention, by NSB task forces, to two or three issues which had been identified several months before jointly by the Board and NSF staff as topics warranting special attention. Most of the topics selected for in-depth examination seem to be done more at the insistence of the Board than the Director. Nevertheless, most are reactions to situations rather than anticipatory national policymaking. Generally, NSF staff members play a major role in preparing the background documents required for these meetings. The work of the June PPC task forces is iterative, often continuing over several months and leading to the creation of PPC Subcommittes or the adoption of an NSB resolution.

Issues for Consideration

Several major issues can be raised about the impact of the PPC:

Are the policies enunciated sufficiently detailed and long-range to provide the Board with a well-thought-through policy base from which it can undertake sustained long-term policymaking?

Has the Board been sufficiently foresighted to deal with such issues as the possible need to limit science funding only to proven university performers (thereby jeopardizing geographic distribution patterns) in the face of budget cuts made by the Reagan Administration?

Does the Board follow-up on the NSF staff response to the policy statements enunciated by the PPC and the NSB?

Is it sufficient for the Board to enunciate policy via policy statements, directives to staff and creation of ad hoc committees, or should the Board make greater efforts to carry its message to the Office of Management and Budget and other decisionmakers?

Why does NSB choose not to deal with some policy issues which affect science?

Does the Board use specific criteria to select issues for consideration? If not, would not a priority ranking system be useful?

O. NEED FOR AN ANNUAL COMPENDIUM OF NSB POLICIES AND PROCEDURES

Another aspect of the Board warrants attention. This relates to the possible need to compile an annual report on NSB procedures and policies. An attempt is made in this report to include all NSB-issued policy and procedure decisions and statements since 1968. (See Appendix B.)

In 1976, former NSF General Counsel Hoff recommended that the Board or NSF staff collect and publish all substantive and procedural statements made by the Board. He said that policy is enunciated in various ways, not only by means of formal policy statements. Furthermore, if the Board were to collate policy statements, its programs approval responsibilities would be lessened since the Director would have to bring to the Board only those awards on which NSB had not enunciated policy. Furthermore such a tool would aid in oversight.

Attempts were made over the years to achieve this goal, but without success on the grounds that policy statements take too many different forms. It was recommended that the NSF *Program Manager's Manual* (which in some respects reflects the administrative interpretation of NSB policy statements) serves as a publicly available statement of NSB policy statements. According to former PPC chairman William Hubbard, the statute governing the board of the National Library of Medicine may serve as a useful precedent. It requires the Secretary of Health and Human Services to publish an annual report or compendium of this sort, to include details on policy as well as administrative implementation. Application of this practice by NSF might aid in establishing better oversight over the Board. However, there are disadvantages to such a proposal. The NSB might perceive such a recommendation as a threat to the freedom of scientific inquiry and as an unwarranted incursion into the tenuous compromise and "shared authority" worked out over the years between the Director and the Board. Thus, such a recommendation might engender undesirable inflexibility on Board procedures and topics, compromising the creativity of the Board as a whole and the contribution of individual members.

Issues for Consideration

The requirement for a collection of policy statements, including those which are not given resolution numbers, seems to warrant consideration, for it is difficult now to identify NSB policy statements and determine actions taken by NSF and others to implement the policies enunciated.

P. THE PROGRAMS COMMITTEE AND THE BOARD'S APPROVAL RESPONSIBILITIES

The Programs Committee (PC) is the Board's principal mechanism to review proposed grants, awards, and programs that require Board approval before the Director can commit funds or implement the involved new policies (as specified in sections 4(a), 5(d), and 5(e) of the National Science Foundation Act, as amended). The NSF staff is required to bring the following items before the Board for review and approval:

1. Proposed plans for a new NSF program as well as final program plans;
2. Proposed awards initiated under any new program, until such time as the Board has authorized application to such program of its general delegation to the Director;
3. A policy issue that has not previously been resolved by the Board or a proposed change in a policy previously approved by the Board;
4. Requests for Proposals as well as solicitations and other announcements where awards are expected to require Board approval;
5. (a) A single award or project commitment that will exceed $500,000 or more for a period of 12 consecutive months. (b) An actual or eventual anticipated total award or project commitment of $2 million or more.

The dollar limits referred to above were incorporated into the NSF organic act by amendment in 1968. It limited the Board's discretion to delegate its approval responsibilities which it had held since 1959. This, in effect, required the NSB to perform more program approvals than it had done before.

1. Programs Committee Workload: Ambiguity in Data

From 1970 to 1975 the PC workload increased significantly since the committee elected to approve all awards for the RANN program. The Board in the mid-1970s called for changes in the enabling legislation, either to raise the dollar limits above which the Board's approval was required or to give the Board discretion to approve only those awards relevant to policy considerations. However, NSB ceased making these demands shortly after the Board decided to increase its oversight functions in reaction to criticism regarding inadequate management of NSF's pre-college science curriculum development programs. This led to an overhaul in the award process within NSF by creation of action review boards in each NSF directorate to establish award procedures, and creation of a Directors' Action Review Board (DARB) to review and approve all awards before they are sent to the PC. It also led to an NSB decision to require staff to send the PC copies of all peer reviews received and to send anonymous peer reviews to all proposal writers upon request. For each of the seven to nine times a year the Programs Committee meets, its members receive a monthly information package containing from 500 to 1,000 pages of descriptive materials and peer reviews.

The PC and the full Board both treat the program review and approval function rigorously—spending a significant amount of time discussing such factors as qualifications of principal investigators (PIs), quality of previous research and publications, quality of facilities anticipated to be used, and, often, aspects of research design.

An analysis of proposal review and approval activities for the period 1972 through 1979 shows that an increasing amount of time is being taken in order to accomplish these Board review and approval functions, even though the Board modified only about five percent of the proposals submitted to it for approval (or, in one case, rejected). The amount of time spent per award package has increased from .14 hours in 1972 to .73 hours in 1979.

Data describing the PC workload, measured only in terms of the numbers of awards reviewed and approved, shows a downward trend since the mid-1970s. Such a trend is not consistent with the increases that might be expected due to expansion of budget and inflationary factors.

Data describing the PC workload from the mid-1970s to the present is ambiguous, because the Foundation often groups together as one award a series of related projects (each of which may exceed the dollar limits), but apparently without using consistent criteria. Many NSB members and senior NSF staff have said that the NSB is overburdened by the requirement for program and award approvals. However, during the summer of 1980, the PC examined its workload and reported that it was not overburdened by its oversight and awards review functions and therefore did not seek a change in statutory language requiring proposal reviews.

According to NSF, two factors would tend to decrease the number of awards and information items referred to the Board:

Multi-year approvals of continuing grants; and

A 1977 NSB revised policy statement which says that increments made to awards already approved by the Board do not need new Board approval unless a new peer review is conducted.[21]

Also, the Foundation has instituted a procedure which requires the Director's approval of an award package (in the form of approval by the Director's Action Review Board) before the proposal is sent to the Programs Committee and then the full Board, thereby cutting back on the number of unacceptable awards, but, perhaps, making redundant the NSB function. The NSB rarely alters what the DARB has done.

Issues for Consideration

The Congress may wish to reexamine the need for the redundancy implied by the statutory requirements regarding awards approval, especially now that the Director has developed procedures for approving all awards before they are sent to the NSB.

Despite the fact that the Programs Committee believes is it not overburdened by its awards approval functions, should the dollar requirement be raised, to free time to permit the Board to deal more with policy issues?

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[21] NSB Circular No. 107, revision No. 2, Oct. 1, 1977, says: "In determining whether the commitments involved exceed the $2 million cumulative limit or the $500,000 annual limit, following an initial award (any standard grant, continuing grant, cooperative agreement, contract, or other arrangement) every additional award should be added to the initial award if: (a) the successive award is made to the same investigator; and (b) the award is based upon the external peer review of the earlier award rather than a new peer review. Otherwise, each award will be counted separately."

Some NSF staff and NSB members say that the program approval function requires considerable time and has become a burden, preventing them from engaging in other policymaking activities. But views and statistics differ on this point. At the same time, most members say that the requirement serves a useful purpose since it enables the Board to learn about the details of program administration in NSF. All governing boards are faced with the dilemma of determining the adequate level of detail needed to conduct their planning and oversight functions. The question can be raised: could NSB's quality control procedures be met by more streamlined methods? (This report covers the period from 1968 through December of 1980. In February 1981, after the draft of this chapter was finished, the Programs Committee adopted a streamlined review procedure intended to shorten the time required for Programs Committee meetings. Henceforth only two or three PC members, rather than the full PC, will be responsible for in-depth review of proposed awards sent to the PC for approval. In addition, the NSF staff will no longer be required to present detailed information to the full PC on the awards packages. Based on their review of mailed, written materials and phone calls to NSF staff, the designated PC reviewers will recommend action to the full PC, which will then report to the full NSB.)

In his review of NSB/Director roles, former NSF General Counsel Hoff recommended that the Board collate and codify all policies and procedures it had enunciated, to be used as a basis to determine whether or not programs and awards need to be reviewed (that is, if they contained policies not already enunciated). Former PPC chairman Hubbard has said the NSB is too involved in program approvals, and that the staff should submit only those new awards containing policy issues.[22] Should the PC procedures be revised to differentiate between the approvals needed for different kinds of programs (new programs, which seem to be primarily for congressionally mandated activities, versus large continuing programs)?

In testimony before the House Science and Technology Committee, former NSB Chairman Philip Handler testified that the Congress ought to consider revising requirements for program approval with a view toward making the Board responsible for all awards, since larger awards are better prepared than smaller awards and now the Board is not required to review the smaller awards. Should the PC be more involved in evaluating on-going and proposed NSF programs, instead of primarily serving as a mechanism for the review of proposed awards (and groups of awards) over the dollar limits specified in section 5(e)?

At least up until the time of the Reagan Administration, societal pressures were mounting for the Federal Government to assume greater responsibilities for supporting and, to some extent, sharing in the management (with industry) of large-scale, interdisciplinary applied projects to solve problems or to force the development of knowledge necessary to bring a technology to the proof-of-concept state, in the expectation that such activities will enhance productivity.

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[22] Interview.

Research support and procurement mechanisms typically used now in NSF may not be adequate to govern such activities. For instance, the Congress had to urge action to enlist NSB governance of the Ocean Margin Drilling Project. The question of whether a part-time basic research/academically oriented Board can oversee several of these activities remains unanswered. The guidance provided by historical precedent indicates that the Board may not be able to cope successfully with such a burden. In the early 1970s when NSF began the RANN program, NSB chose to approve all awards for several years until members were satisfied that the program was producing quality work. The evidence seems unequivocal, however, that these program approval, design, and management responsibilities proved to be taxing to the Board. To the extent that the lessons of the past guide the future, it seems apparent that before NSF responsibilities are enlarged or significantly augmented, the Congress and the Board should assess fully the implications of NSB workload responsibilities.

2. Absence of a Programs Committee Role in Determining Priorities for Support and the Importance of Advisory Committees

While the Board spends considerable time looking at individual awards, it does not have a formal systematic procedure to use its knowledge in determining priorities for NSF programs, directorates, or scientific disciplines. The only formal procedure now is for the Budget Committee chair to sit in on Programs Committee meetings as an observer. This was not always the case. For a few years after it was first created, the PC created a variety of subcommittees to deal with program planning in such areas as applied research, energy, and social sciences. The PC has not engaged in activities of this sort recently, and NSF advisory committees appear to have taken on preeminent responsibilities in these areas under recent Directors. Formerly, the PC had responsibility to consult with the Director on his list of candidates for membership of the advisory committees, and the chairs of the advisory committees were required to report annually to the Board. But pursuant to Board-adopted resolutions, these responsibilities have been terminated. Now, Board members attend advisory committee meetings from time to time, prepare a written report for the chairman of the Board and subsequently present a cursory oral report to the full NSB. However, usually the report is devoid of any notable policy dilemmas or actions requiring Board approval. The Board has not spent much time interacting with advisory committee members or discussing details of advisory committee work.

Another measure of the relationship between the Board and the advisory committees is the rate of NSB attendance at meetings of advisory committees and their subcommittees. The NSF fiscal year 1979 report listed as advisory groups, with potential for NSB interaction, 23 advisory committees, one advisory council, and 47 advisory committee subcommittees. During the fiscal year 1979, NSB members attended only 12 meetings of these 71 bodies, and four other NSF-sponsored meetings.

Issues for Consideration

Several factors seem to argue for a reassessment of the relationship between the Board and the NSB advisory committees with the intention of improving communications between these groups. One is the advisory committee chairmen's need, expressed recently to the PPC chairman, to meet more with the Board; another is the opportunity that would be provided by closer Board attention thus enabling the Board's budget and program decisions to profit from the priority-setting, planning, and budget-related exercises of the advisory committees. The Board also might profit from the wider spectrum of views presented by advisory committee discussions. Two costs might be incurred by such cooperation: the Board would be involved even more in "micro-management" and the advisory committee's expression of candid views to the Director might be jeopardized.

3. Program Reviews

The PC and the Board also utilize other mechanisms for program oversight. The PC from time to time engages in what is called "informal program reviews" when members review management effectiveness—comparing, in one program area, the quality of proposals for which funds were awarded against a few randomly selected proposals which were declined. Also the full Board is given formal program reviews of scientific achievements in selected program areas, usually at each meeting. However, these Board reviews apparently are done mainly for public information; they are the second part of a two-part review which begins with a complete and candid presentation before the Director.

Issues for Consideration

It is not readily apparent how these program reviews aid in NSB oversight or in program planning. Since many of the program reviews seem to be perfunctory, the question can be raised what steps can be taken to ensure that the Board is presented with candid and penetrating program reviews?

Q. THE BUDGET COMMITTEE

The NSF budget is of necessity the "Director's budget," since the Director needs to be more responsive to the President than the Board, and the Director and his staff, not the Board play the major role, in preparing and defending the budget, and interacting with OMB staff.

Prior to the amendment of the NSF enabling legislation in 1968, the NSB and the Director seemed to have shared authority equally in formulating the budget. During the period 1969 to 1978, despite many complaints from Board members, the Board played a much smaller, though gradually increasing, role in budget formulation processes. From 1969 to 1973, the Budget Committee and the Executive Committee were the same, virtually ensuring the Director's domination of the process. The Planning and Policy Committee created a Budget Management Subcommittee in 1973. In 1974, a major step was taken toward improving the Board's role in budget-making when the Board created a new Committee on the Budget (COB) as a separate task committee.

Another major innovation in the budget-making process occurred when a task force of the June 1976 long-range planning meeting recommended that the NSB and Foundation institute a process called the "planning environment review." This gave the Board staff-prepared information and analysis to enable the Board to compare NSF's programs and priorities to the total field of private and publicly supported research. The Board also decided to select several "infrastructure" issues for added attention each year. The Office of Planning and Resources Management prepares the reports used (the current version is called *Status of Science*). However, the program managers contribute to and are also required to analyze each program in terms of the issues the Board had identified.

Prior to 1978 the budget process consisted primarily of the Board reacting to dollar estimates and needs determined by the Director and staff, or recommending expenditure levels determined by simple across-the-board percentage increases, which the NSB criticized as being "unrealistically high."

These procedures were significantly refined after zero based budgeting was instituted and when, beginning in 1978, the Board began to require program managers, first, to determine research needs or priorities for directorates based on a scientific needs assessment and, then, to determine required expenditure levels. The NSF Assistant Directors (ADs) had, for several years, presented the Budget Committee or the Board with written materials identifying long-range plans. However, in 1978, the Board adopted a new procedure—requiring the Board to divide itself into working groups to review in detail the oral and written presentations on long-range plans made by the ADs. Also, new procedures were adopted which required the ADs to present separate statements on priorities figured on the basis first, of scientific need, and then, in a second document, on the basis of dollars needed.

In 1979, for the first time, when beginning the NSB budget cycle for the fiscal year 1981 budget, the Board adopted a procedure whereby each NSB working group presented the Board with recommended priorities for support and general levels of funding for each directorate, to be used by the Committee on the Budget in preparing a report to the full Board for use in a Board budget resolution. The Director customarily uses the resolution and the detailed reports of the COB to formulate the specific details of the budget he sends to the OMB in early summer.

The Board also has adopted procedures which permit the Committee on the Budget to work with the NSF staff in preparing the required ZBB budget estimates after receipt of the President's budget goal, a significant departure from previous budget-making activities. But once the budget is sent to OMB, the Board has little or no ability to influence the major protagonists in NSF budget-making, the OMB and the Congress.

NSF officials play the major role in defending the NSF budget before congressional committees. Until the last few years, NSB testimony before these committees did not articulate NSB-established budget priorities. In fact, during most of the 1970s, NSB testimony was primarily philosophical in nature. However, recurring NSB priorities over the last few budget cycles have included emphasis on basic research or maintenance of "core support" in all disciplines, investigator-initiated research. instrumentation, computer research, cutbacks in large-scale equipment expenditures, special emphasis for social and economic sciences research, and increases in funding for science education.

Issues for Consideration

Although the Board's budget-making activities have been enlarged and substantively improved over time, room for improvement still arguably remains. The major issue would seem to be the link between oversight and budgeting. As noted above, the Programs Committee does not play a major role in priority setting at program or division levels. It is difficult to discern how the Programs Committee communicates its view about research needs and priorities to the Budget Committee. The only vehicle that now exists for such communication is joint membership on both committees. Advisory committees are critical players at this level.

Would NSB budget presentations before the Congress be more effective if the Board were to take a larger role in describing its budget priorities and if the NSB budget resolutions and reports were a matter of public record?

What costs would the NSB incur if the Board were to take a public position different from the OMB?

R. NATIONAL SCIENCE POLICY-RELATED ACTIVITIES OF THE BOARD

The NSB has two kinds of policymaking responsibilities. The first relates to policymaking for the NSF. The NSF Act reads "In addition to any powers and functions otherwise granted to it by this Act, the Board shall establish the policies of the Foundation within the framework of applicable policies as set forth by the President and the Congress." The Board also has joint responsibility with the Director to promulgate broader national science policies. The Act specifies that "The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences."

On balance, the NSB does not play a major role in this second broader national science policy area to ". . . recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." Its policymaking responsibilities are, for the most part, limited to enunciating policies for NSF. On those few occasions when it has enunciated national science policy, policy has been limited to infrastructure issues relating to funding, manpower, and enhancement of the conduct of research, especially basic research, in other agencies. The NSB has not enunciated any notable policy statements specifically relating to the application and use of science and technology to solve social problems (an example of "science for policy") or to adjudicating disputes of scientific fact. These are national science policy functions which typically have been the responsibility of other agencies, such as the President's Science Advisor, the Office of Science and Technology (OST), the Office of Science and Technology Policy (OSTP), and the National Academy of Sciences.

The National Science Board's annual reports have been a major Board forum for recommendations on national science policy in those areas characterized as "policy for science." The Board published eleven reports for the years 1969 through 1979. The first few reports dealt mainly with the health and status of science and made specific recommendations for ways to improve funding, manpower, and research in certain areas: graduate education, physical sciences, environmental science, and science and engineering manpower in national policy. Then in 1977, the Congress limited the Board's annual report function to deal with matters substantially affecting NSF and its support functions.

The Board *per se* has very little contact with the presidential offices or with other agencies. The history of the Board indicates that the NSB is powerless in the face of presidential decisions and OMB dictates. Two examples may suffice: in 1970 OMB forced NSF to establish the RANN program which thrust vast new responsibilities upon NSF in applied science—an area outside of the traditional mainstream of NSF responsibilities (for basic research). At the same time the OMB forced NSF to terminate its institutional support program, an area critical to NSF's traditional mission to support academic basic research. The Board was not successful in appealing these changes. Also in 1981 the Reagan Administration targeted cuts of over $300 million in the NSF budget, making cuts in areas that the NSB's Committee on the Budget had singled out for special emphasis. Again the NSB had no authority or persuasive force to change these budgets since it has virtually no ability to influence Presidential funding decisions and no ability to influence budget decisions after the Director sends the Board's recommended budget to the OMB.

The Office of Science and Technology Policy and the President's science advisor have, from time to time, asked the NSB and the NSF staff separately to provide support services. The Directorate for Scientific, Technological and International Affairs in NSF (STIA) was established in part to provide analytical support to the OSTP (whose budget and support staff has been extremely limited). The two report functions given to OSTP with P.L. 94–282, the National Science and Technology Policy, Organization, and Priorities Act of 1976, were transferred to NSF with Reorganization Plan No. 1 of 1977. The functions were transferred however, specifically to the Director, not to the Foundation; the Board has not played an important role in preparing these reports.

According to several high-placed officials, from time to time the OSTP or the science adviser has asked the NSB specifically to evaluate certain policy areas or answer questions. Apparently the Board has not responded effectively to these requests, which have related, for example, to materials sciences, young investigators, aging capital stock, changing university environments in the 1980s and automobile research initiatives.[23] The Board's lack of response may be due to lack of time or to a conscious decision not to get involved with potentially controversial policy issues.

The Board does not have formal relationships with other science support agencies. From time to time officials from other agencies have made presentations to the Board on timely issues. On at least two occasions since 1968, the Board has enunciated policies which were directed at other Federal agencies: a statement encouraging mission agencies to continue to fund relevant basic research in 1975, and a statement applauding the inception of a basic energy research program in the Department of Energy in 1979. The Board has also issued statements which seek to clarify NSF's need to conform to regulations issued by other agencies, such as when the Board sought to obtain an exemption for NSF-funded laboratory research from OSHA regulations relating to handling of toxic substances.

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[23] Interview.

The National Science Board had a formal national science policy responsibility from January 1973 through the summer of 1976. During this period, the NSF Director served as the President's Science Advisor. The NSF Director/Science Advisor was supported by an NSF office which he created, the Science and Technology Policy Office (STPO) after President Nixon terminated the White House science office and before the passage of P.L. 94–282 which re-created a White House science policy advisory apparatus. During this period, the Board assisted the Director in his capacity as Science Adviser to the President and was more immersed in national science policy matters than before or since. Board involvement in these matters was mediated through a Committee (initially a subcommittee) on National Science Policy, which operated during 1974 and 1975.

During 1973–1976, the National Science Policy Subcommittee formulated several recommendations, which the full Board later adopted, for policies that the Science Adviser should pursue dealing with health-related regulations. The Subcommittee also reviewed several NAS reports and recommended policies that the Science Advisor should adopt based on their findings. However, the Board, like the defunct President's Science Advisory Committee (PSAC), came to realize that its advice would be superfluous if it was not asked for. Furthermore the Board agreed, in the main, with a conclusion reached by one of its members who had been a member of PSAC, Dr. Frank Press, the most recent science adviser, that the NSB could not function as effectively and broadly as PSAC since a major commitment of time and effort would be required if the Board were to discharge a science policy role comparable to that of PSAC. To fulfill this larger role would be difficult if at the same time the Board discharged its statutory duties as the policy-making body of the Foundation.[24]

Some NSB members as well as staff of the Office of Science and Technology Policy have recommended that attention be given to reviving the national science policy role of the Board. They give several reasons to support this point:

the President's Science and Technology Committee (created pursuant to P.L. 94–282) was allowed to lapse,

the NSF Director explicitly, and not the Board, has been given some major national science policy functions, and

the Board is a highly accredited and knowledgeable group of scientists whose expertise should be utilized to the fullest.

In fact, Rep. Wampler introduced a bill in the 97th Congress, H.R. 638 of January 5, 1981, the National Science Council Act of 1981, which would establish a National Science Council in the National Science Board to decide, after a hearing on the record, any question of scientific fact arising in an agency adjudication referred to the Council which involves the harm any substance may cause to human health. He had introduced a National Science Council Act in 1980, which would have created the council in the Office of Science and Technology Policy (H.R. 6521).

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[24] ES : 169 : 12. See chapter IX.

In 1976 former NSF General Counsel Hoff recommended that the PPC be reconstituted as a National Science Policy Committee with functions devoted exclusively to national science policymaking. Both NSB Chairman Lewis Branscomb and former presidential science advisor Frank Press have identified national science policy issues which they believe the Board should address.

In 1980 new NSB chairman Branscomb told the Board that steps should be taken to improve the utility of the Board's long-range planning meetings. Procedural work should be minimized in favor of discussing long-range issues in depth. "Board members . . . [should] try to focus on the major underlying issues that the Board frequently becomes involved in, often without sufficient time to discuss in depth." Discussion groups should make specific recommendations for additional work which the Board might undertake and mechanisms to accomplish tasks. Recommendations also should be addressed to the NSF staff and the science advisor. Previously Branscomb had listed four strategic issues with which he thought the Board should concern itself over the next five years; productivity, industrial technology and innovation; key fields at the cutting edge of science; the world scene; and rebuilding the Nation's technology. He also re-created the PPC National Science Policy Subcommittee, later renamed the Ad Hoc Subcommittee on NSB and National Science and Technology Issues.

In contrast, former Board Chairman Hackerman did not believe that NSB should get too involved in national science policymaking. To succeed in dealing with national science policy, the NSB would have to choose to respond to OSTP requests for assistance (which the NSB has often rejected) ; the White House and the President's science adviser would have to seek out NSB policy guidance deliberately; and the Board would have to agree to involve itself in controversial science policy decisions and matters of scientific disputes issues which students of the OST and OSTP characterize as critical to the function of national science policy advising.[25] It might also be necessary for a National Science Board seeking to influence other agencies to consider the relatively smaller size and influence of the Foundation when compared with other agencies which support science and technology.

Issues for Consideration

Would the Board's responsibilities for formulating policy for NSF be compromised if the Board were to undertake more national science policy functions?

Since NSB deals basically with short-range policy issues, would it have traditions, experience, and support staff required to deal with longer-range, more strategic science policy issues?

The experience of the former President's Science Advisory Committee and of the Office of Science and Technology, as well as of the NSB's National Science Policy Committee indicate that such efforts are wasted unless they are directed at a specific audience, and unless that audience is receptive.[26]

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[25] See for instance: Burger, Edward J. Science at the White House. A Political Liability. Baltimore. The Johns Hopkins Press. 1980, especially Chapter 8.

[26] Burger, op. cit., Beckler, David Z., The Precarious Lack of Science in the White House. Daedalus., v. 103, Summer 1974: 115–134; and Golden, William T. ed., Science Advice to the President, New York, Pergamon Press, 1980, 256 pp.

If the NSB were to take on a larger national science policy role, can it be assured of having a receptive audience?

In order to play an effective national science policy role, NSB would probably be required to have more access to detailed information about other agencies than it now receives from the *Status of Science* document and would need a large support staff. Is Congress willing to grant these authorities?

Since the NSB is a part-time Board, would it have an ability to respond in a timely manner to national science policy issues thrust upon it?

S. THE REACTIVE ROLE OF THE BOARD IN MATTERS OF NSF ORGANIZATION AND REORGANIZATION

The Board generally plays a minor or a reactive role in matters dealing with NSF's organization and reorganization. Several factors explain the absence of a prominent Board role in organizational issues. One is that most of the programmatic changes that NSF makes are imposed externally—by the Congress and by the Office of Management and Budget. Of equal importance is that most of these changes have dealt with applied research and with science education. The NSB has often opposed adding new programs in these areas to the NSF mission.

A second factor which contributes to the absence of a preeminent Board role in organizational issues is a congressionally imposed decision made in 1968 to curtail the Board's authority in this area in favor of the Director, who now is obliged only to consult with the Board in matters of reorganization.

One basic conclusion to emerge from this study is that most of the programmatic changes made in NSF are imposed externally. Nevertheless, the Board spends considerable time dealing with these changes, which generally affect ten percent of NSF's annual budget at the periphery of the agency's mission. However, the Foundation's leadership, supported by what some might describe as Board intransigence and what others might call Board persistence, has managed to maintain what the Board has chosen to see as the "core" of the agency's mission—that is, to support basic research in academic settings.

During the period 1968 through 1980, the Board's role in matters of reorganization has been mainly after-the-fact opposition to virtual faits accompli motivated by the Director's decisions or by external events, including OMB actions. None of the Board's major continuing committees has had any apparent responsibility for organizational issues. The Board has established *ad hoc* committees to deal with organizational issues—but usually only after the Director has announced a reorganization decision. The Board's basic policy on organizational matters during this period has been to maintain and increase NSF's responsibilities for basic research in universities. Nevertheless, the Board has spent considerable time discussing the details of administrative actions which the Director had already decided and which the Board almost never changed. Since late 1979, the Board appears to have taken a more active role in discussions and decisions relating to reorganization. This may have occurred because the NSF directorship was vacant when some of the major decisions needed to be made. Despite the Board's recent interest, the OMB and the Director remain supreme in organizational matters. Such a situation is probably entirely consistent with legislative expectations of how the Board should spend its time.

The Research Applied to National Needs Program was initiated by OMB without consulting the Board. After the program began, the Board, concerned about the quality of science contained in this applied program, sought to exert its influence by ensuring program oversight. The Board did not delegate authority to the Director to fund projects, without Board approval, until two years after the program was started.

In some cases the Director has presented the Board with organizational plans he drew up for Board approval. In three major instances NSB delayed or obstructed these plans because of objections, and to allow time for consensus generation within the wider scientific community. In one of these cases, the reorganization relating to the creation of the Directorate for Applied Science and Research Applications (ASRA), the Board managed to modify slightly the Director's proposed plans. In two cases—creation of the Engineering and Applied Sciences Directorate and creation of the Directorate for Engineering—the Director's plans were adopted virtually as presented to the Board, but after Board delays.

Issues for Consideration

Since the Board has little visible influence, but spends considerable time, in determining NSF organizational changes, should it delegate complete authority to the Director in this area?

Since many programmatic changes are imposed by the Congress, thereby constraining the Director's role, would it be possible to develop a long-term agenda or plan for changes, to minimize disrupting the Director's organizational plans?

T. ANNUAL REPORTS

P.L. 90–407, the 1968 amendments to the NSF organic act, required the Board to render an annual report to the President: ". . . on the status and health of American science and its various disciplines" for submission to the Congress. From then until 1976 the Board prepared a variety of reports, mainly on an in-house basis. They used the same basic format, giving: the state-of-the-art, the health of the research and training effort, and recommendations for improvement (that is, Federal research support, training funds, and so on). The following substantive reports were of this nature:

> *Toward a Public Policy for Graduate Education in the Sciences, 1969;*
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> *The Physical Sciences, 1970;*
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> *Environmental Science—Challenge for the Seventies, 1971;*
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> *The Role of Engineers and Scientists in a National Policy for Technology, 1972,* and
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> *Science and the Challenges Ahead, 1974.*

The Board also began the preparation of its statistical chartbook series, *Science Indicators*, during this period. Four indicators volumes have been published thus far, each successively more detailed and sophisticated than its predecessor. More explanatory textual material, as well as public opinion surveys, are being included in the current volumes.

The requirement for the Board to produce an annual report was abolished in 1976 with the passage of P.L. 94–282, the National Science and Technology Policy Organization and Priorities Act of 1976, presumably in the expectation that the reporting requirements given in the Act to the statutorily-created White House science policy apparatus (OSTP) would fulfill the functions of the NSB report. The OSTP was required to prepare an annual report on the status of science and technology with recommendations for its improvement, and a Five-year Outlook. The Board objected to the removal of its report requirement, which was reinstated in 1977. However, the purpose of the required NSB report was reduced from the broad national science policy requirements to report "... on the status and health of American science" to the more limited goal of reporting mainly on science policy issues which more directly affect NSF.

The NSB reports produced since then meet this more limited goal and do not include funding recommendations like their predecessors. These reports are:

> *Science at the Bicentennial—a Report from the Research Community, 1976;*
> *Basic Research in the Mission Agencies—Agency Perspectives on the Conduct and Support of Basic Research, 1978;*
> *Only One Science, 1980, and*
> *University/Industry/Cooperation in Science* (*planned*).

The Board establishes committees to oversee the preparation of reports. Since the series began, the reports have become more costly. As they have become research reports, rather than advisory reports, more outside contractors have been used to prepare them. As a result, the estimated cost for *Science Indicators 1978* is over $600,000; costs for preparation of the 12th report (which is delayed and not finished) total about $300,000 so far. If contractors are not used, the burden of preparing the report falls on NSF staff. Nevertheless, the record shows that NSB members provide rigorous and time-consuming oversight.

Issues for Consideration

The implications of these factors might warrant attention, especially considering current calls to coordinate the preparation of federally-generated long-range science and technology planning documents. These include the NSB reports and the OSTP reporting requirements which were transferred to the NSF Director, with the reports now being prepared by NSF staff.

Currently the Board maintains that while it wants to retain authority to prepare a report, it wants to choose to produce one only when it believes one is warranted. The Board apparently believes that its policymaking functions might be met better if time were allocated to functions other than annual production of a time-consuming report. The Board adopted a resolution calling for legislative changes which would make the Board report series on *Science Indicators* mandatory every three years, and would allow the Board to produce substantive reports in alternate years as the Board chooses. Congress has not enacted these changes yet.

Should report writing requirements be combined so that the Board plays a substantive role in helping NSF prepare the reports it prepares for OSTP, rather than merely commenting on them after they are written?

If it is decided that the Board should play a larger "national science policy role," should be the statutory language of the annual report requirement be changed to reflect a broader perspective?

Several recommendations have been made to require the Board to compile a collection of all its procedural and policy recommendations together with an indication of NSF responses to them. Should this constitute the annual report?

U. SCIENCE EDUCATION

The NSF Advisory Committee on Science Education has stated repeatedly over the years that the Board has not accorded science education a sufficiently high priority within the NSF support program. Since its inception, NSF has had responsibility for science education, but the 1973 NSF authorization act added language to require the NSF to support programs specifically in science education independent of their immediate effects on scientific research potential. (P.L. 92–372.) However, the Board has not had a continuing committee on science education and, perhaps as a result, has not always been prepared to deal with policy dilemmas in this field. It has tended to react after the fact to educational policy support issues when confronted with problems in NSF's science education activities or with cuts threatened for science education.

For example, when preparing the fiscal year 1982 budget, the Budget Committee recommended increases in science education, but only after the Science Education Advisory Committee asked it to do so. When it has articulated a policy for science education, the Board has emphasized that NSF's core responsibility in science education is to train science professionals and to augment the conduct of research in universities, which means support primarily at the doctoral and postdoctoral levels. The Congress consistently has raised NSF's science education support budget, especially for pre-college science education, above the amounts requested by the Foundation. The Board has not mirrored this level of concern. The Board's traditional lack of attention to science education, especially to pre-college science education, may well stem from the under-representation of pre-college science educators on the Board, a charge levied several times by the Senate and House authorization committees.

The NSB did take a positive stance on the issue of maintaining vigorous education programs in NSF when confronted with the creation of the Department of Education (except that it recommended the transfer of some primary, secondary and collegiate programs which the NSF Director apparently opposed).[26a] But in 1980, the Advisory Committee on Science Education prepared a comprehensive report for the NSB on *Science Education in the 1980s*. The chairman of the Advisory Committee said that the act creating the Department of Education for the first time clearly defined NSF responsibilities in science education. As a result it would be appropriate, he said, for the Board to review these responsibilities. The Board Chairman assigned the major recommendations of the Science Education Advisory Committee report as follows:

[26a] CS :196 :17.

The NSF should accord a higher priority to science education and significantly increase its funding in substantial increments over the next four or five years. This new level of funding should be achieved without sacrifice of support to other essential Foundation activities. (Assigned to the NSB Committee on the Budget.)

The NSB should initiate joint studies with the Advisory Committee for Science Education to relate more effectively science education programs to overall Foundation objectives and national needs. (Assigned to the PPC.)

Following these proposed studies, the NSB should generate a special major report on science education. (Assigned to the PPC.)

The PPC subsequently began work to prepare the studies and established a science education subcommittee. (See Chapter XVII.)

V. The Committee on Audit and Oversight

The Board's oversight authority is exercised several ways, including the Programs Committee and NSB approval of certain new awards, Programs Committee informal program reviews, and by full Board formal program reviews attendance at meetings of advisory committees and the council, and participation in site reviews of National Research Centers and Materials Research Laboratories. The Board also exercises oversight authority via the work of the Committee on Audit and Oversight. The Committee and its predecessors were created in the aftermath of the MACOS incident. The Committee's basic function is to assist in developing and in overseeing the quality and effectiveness of NSF pre-award evaluation and selection processes and more recently to oversee the development by NSF staff of post-award and research evaluation procedures. (See chapter XIV.)

The Committee's work exemplifies how this Board committee exercises quality control authority by developing policies to ensure that proper staff procedures are followed (rather than getting involved in administrative details). The Committee itself did not write the procedures it was evaluating and perfecting. It also illustrates the procedures used typically by an NSB committee, the necessary reliance on NSF staff support, and the actual effectiveness of a committee oriented to improving NSF administrative practices.

W. Committees on Basic Research and Big and Little Science

The NSB's role related to developing or revising forms of grants and contract mechanisms has been limited primarily to giving advice to the Director regarding the existence of a problem and then, after staff study, concurring with and, perhaps, refining mechanisms developed by the staff and the Director—rather than designing a solution to a problem.

The Science Board has dealt with most procurement issues in two committees—both of which were terminated in late 1980. These committees were the Committee on the Role of NSF in Basic Research, created in 1974, which dealt primarily with procurement issues related to university research, and the Committee on Big and Little Science, created in 1978, which was established after congressional criticism of the Ocean Margin Drilling Program, to provide an appropriate balance between support for individual project awards, and large-scale program and project awards.

As is typical of other NSB committees, the NSF staff has played the major role in preparing most of the background and analytical studies necessary for the work of these committees.

Since one of the Board's major continuing goals has been to sustain the infrastructure of science—especially for the conduct of quality basic research in academic settings—the Committee on the Role of NSF in Basic Research has played more of a role than other committees in initiating inquiries and guiding staff support. For instance, the Committee's inquiry into the quality of basic research in universities led to a major staff study on the topic; it initiated efforts to alert heads of Federal agencies about the need to maintain adequate levels of support for basic research in mission agencies, which led to an annual report and several Board policy statements on the topic; it conceived of the concept of creating departmental research centers (later modified by the staff in favor of group research grants); and it played a crucial role in starting inquiries into the problems of young investigators.

NSB has dealt with several other issues affecting the quality of basic research in universities, which this Committee has not addressed. These issues include basic research stability grants, the policy of not supporting research-related activities performed by other agencies, and objections to OMB Circular A-21 (which critics have charged NSB did not address in a timely fashion). (See chapter XV.)

The Ad Hoc Committee on Big and Little Science was created by the Board in response to an external event—congressional questions about whether NSF, especially the Board, had established appropriate policies to determine the distribution between awards for "big and little" science projects in the aftermath of congressional discussions relating to the Ocean Margin Drilling Program. Subsequently, the work of the Committee was enlarged to deal basically with oversight and refinement of new kinds of procurement mechanisms which the Director had established. The Board Committee chose not to recommend strictly defined guidelines to differentiate "big" from "little" science—an attitude typical of the "hands-off the research community" notion that has prevailed in the Board. There is little evidence that this Board Committee itself initiated any of the ideas for new forms of procurement that the Foundation established on an experimental basis. The Committee functioned primarily to refine the concepts after they were developed by staff to ensure that they accorded with implied or enunciated Board policy. Its recommendations were reported to the Board via the Planning and Policy Committee. This occurred with respect to some of the major initiatives discussed in chapters XV and XVI: the policy statement on "big and little" science, policies for small awards, the "master grant" concept, and grant renewal on the basis of publications (as opposed to proposal review). The Board and the staff worked jointly on a staff-inspired plan to overturn a decision made by the Science Adviser to uphold the Foundation policy that industrial contributions to industry/university science projects should be based on a sliding rather than a fixed scale.

II. EVOLUTION OF THE NATIONAL SCIENCE BOARD: 1950–1968

A. Origin of the National Science Board

The present structure and authority of the National Science Board has its origin in the policy debate over how the Federal Government should advance science for the general welfare in peacetime—a debate which began in the United States during World War II and which resulted in the enactment of the National Science Foundation Act of 1950. According to science historian Daniel J. Kevles, "The debate began early in the war and originated in a cluster of concerns among Americans of a liberal political persuasion about the extent to which defense research was dominated by big business in alliance with the leading universities." [1] Wartime Federal contract policy tended to enhance the already high concentration of research and development manpower and funding within a relatively small number of large corporations. This monopolization of wartime research and development effort, as well as the fact that the great majority of these contracts granted ownership of patents derived from this publicly funded research to the industrial contractors, inspired objections from within the American scientific, technical, and small business communities.[2]

1. Congressional Debate Regarding Scientists' Role in Governing NSF

Criticism of the wartime research and development effort that surfaced during congressional hearings was of particular interest to Dr. Herbert Schimmel, a physicist and congressional staff member who became convinced that "the Government should equip itself with means to provide for its technological needs and not rely completely on industries that had not been designed to care for a major war emergency." [3] Dr. Schimmel apparently felt that the remedy to the situation lay in the creation of an Office of Technological Mobilization, incorporating all of the Government's civilian and military technical agencies, empowered to take sweeping actions to facilitate the wartime application of scientific discoveries. He suggested his plan to Democratic Senator Harley M. Kilgore, a freshman New Dealer from West Virginia who was a member of the Committee on Military Affairs. On August 17, 1942, Senator Kilgore introduced S. 2721, the Technology Mobilization Act, which was based on Schimmel's plan. In addition to establishing an Office of Technological Mobilization (OTM), the bill would have created a Technological Mobilization Corporation which was to effect OTM's mandate and which was to be managed by a Board of four presidentially-appointed directors and chaired by the

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[1] Kevles, Daniel J., "The National Science Foundation and the Debate Over Postwar Research Policy, 1942–1945." ISIS, v. 68, 1977, pp. 5–26.

[2] Ibid., pp.5–7.

[3] Bronk, Detlev M. National Science Foundation—Origins, Hopes, and Aspirations. In The First Twenty-Five Years of the National Science Foundation, a Symposium of the National Academy of Sciences, Apr. 21, 1975, p. 6.

OTM Director. Opposition to the bill came from some of those involved in the wartime research and development effort, including Vannevar Bush who directed the wartime Office of Scientific Research and Development, as well as from some academic scientists who feared the effect the bill would have on scientific productivity.[4]

Senator Kilgore redrafted his bill and in February 1943 introduced the revised version as S. 702, the Science Mobilization Act. The new bill would have created an Office of Scientific and Technical Mobilization (OSTM) serving, among other things, to

> . . . develop comprehensive national programs for the maximum use of science and technology in the national interest in periods of peace and war; . . . to promote the full and speedy introduction of the most advanced and effective techniques—for the benefit of agriculture, manufacturing, distribution, transportation, communication, and other phases of productive activity; . . . to promote full employment and higher standards of living after the war; [and] to . . . [make] available to smaller business the benefits of scientific advancement. . . .

OSTM was to be administered by an Administrator, assisted by a National Scientific and Technical Board chaired by the Administrator and including six other presidentially-appointed, part-time members representing industry, agriculture, labor, consumers, and science. S. 702 also would have created a National Scientific and Technical Committee, consisting of the latter Board, Federal agency representatives, and 19 other part-time presidentially-appointed representatives of science, consumers, labor, and management. This Committee was to "advise and consult with the Administrator . . . upon the basic policies governing the administration" of OSTM's mandate.

Many members of the scientific and technical communities opposed the Science Mobilization Act. Several scientific organizations passed resolutions against the bill, stimulating political debate on the part of scientists themselves regarding Federal involvement with postwar scientific research. At the time, many within the academic scientific community, aware of the contribution of scientific and technological innovation to the war effort, were quite sensitive to the impediments to scientific creativity imposed by military security regulations which restricted open scientific communication. This feeling was reinforced by the research successes of the Office of Scientific Research and Development, which was administered and dominated by civilian scientists.[5] Among many academic scientists there developed a resentment of and opposition to Federal attempts to regiment or exert bureaucratic control over scientific research contributing to the war effort, leading to repeated expressions of the need for scientific research to be administered by scientists in an atmosphere of autonomy and free inquiry in order for it to be successful. These concerns were a major factor influencing the proposals, described below, which led to the creation of the particular form of National Science Board that finally emerged in 1950. Indeed, these concerns were expressed in a National Science Board policy statement made in 1954.

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[4] U.S. Congress. Senate. Committee on Military Affairs. Subcommitte on Scientific and Technological Mobilization. Technological Mobilization. Hearings, 77th Congress, 2d session. Washington, U.S. Govt. Print. Off., 1942.

[5] Greenberg, Daniel S. The Politics of Pure Science. New York, New American Library, 1967, p. 79 ff. See also Kevles, op. cit., p. p. 11 ff.

NSB Chairman Chester I. Barnard's foreword to NSF's annual report for fiscal year 1954 included the following policy statement:

> . . . It is clearly the view of the members of the National Science Board that neither the National Science Foundation nor any other agency of the Government should attempt to direct the course of scientific development and that such an attempt would fail. Cultivation, not control, is the feasible and appropriate process here. Both individuals and institutions require public knowledge concerning science that they may continue to act, autonomously but more effectively, in the public interest.
>
> The futility of central control of science arises in part because science is essentially non-national in character, being concerned with natural phenomena rather than policy, but also because pioneering into the unknown calls for imagination and novelty of conception and of method—abilities that are stifled by control and specific direction. This must be conceded to the scientists—not merely because they say so and because the history of science thus far confirms their view—but because it is true also of the application of science and of the management of affairs, public, private, industrial, social or military, though often in much less degree.[6]

In 1944 Senator Kilgore redrafted S. 702 to focus on a mechanism for peacetime support of scientific research. The revised draft proposed a National Science Foundation with authority that would be vested in a Director who would consult with and be advised by a National Science Board. The Board was to consist of the Foundation's Director, who would chair the Board, eight representatives of the major Federal agencies, and eight public members appointed by the President

2. *The "Bush" Report*

Although the Office of Scientific Research and Development was invited to participate in a final revision of the Kilgore bill before its introduction in the upcoming 79th Congress, Dr. Bush had been given the opportunity to have a more direct influence on the design of postwar Federal support for science. President Franklin Roosevelt wrote Dr. Bush on November 17, 1944, requesting him to formulate recommendations concerning four aspects of postwar science policy: the use of warborn scientific information, medical research, aid to scientific research in general, and science education. Dr. Bush appointed four committees to examine these issues, the third issue being addressed by a Committee on Science and the Public Welfare chaired by Dr. Isaiah Bowman. The Bowman Committee report, submitted in April 1945, recommended the creation of a National Research Foundation controlled by a 15-member part-time Board of Trustees, composed of "eminent men who are cognizant of the needs of science, and experienced in administration." The Board was to be appointed by the President from a panel nominated by the National Academy of Sciences, and it was to have the power to appoint the Foundation's full-time Executive Director.

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[6] U.S. National Science Foundation. Fourth Annual Report for the Fiscal Year Ending June 30, 1954. Washington, U.S. Govt. Print. Off., 1954, p. viii.

Based on the recommendations of the four committees he had appointed, Dr. Bush submitted his report on postwar science to President Harry Truman on July 5, 1945. The report, *Science—The Endless Frontier*, included an introductory, interpretive statement by Dr. Bush which consolidated many of the ideas generated by the committees, including a proposed National Research Foundation to support science in universities and other nonprofit institutions along the lines of that recommended by the Bowman Committee.[7] However, the Foundation proposed by Dr. Bush would be governed by a board of nine part-time "Members" who would appoint a Director to administer the Foundation's programs, but who would themselves be appointed by the President from among public candidates of his own choosing. The organizational structure in the "Bush" proposal provided for a large degree of autonomy and a very distinct pattern of authority and responsibility modeled after the pattern of large private foundations rather than that of a typical government agency.

3. Pocket Veto by President Truman

On July 19, 1945, the day that Dr. Bush's report was released to the public, companion bills (S. 1285 and H.R. 3852) drafted in Office of Scientific Research and Development along the lines of the recommendations in the Bush report were introduced by Senator Warren Magnuson and Representative Wilbur Mills. Four days later, Senator Kilgore responded by introducing S. 1297, his revised bill to establish a National Science Foundation. In October 1945 one hearing was held on the Kilgore and Magnuson bills by the Senate Subcommittee on War Mobilization. Ninety-eight of ninety-nine witnesses endorsed the creation of a single Federal agency to support research in the natural sciences. No consensus emerged, however, regarding the extent to which the proposed foundation's administrative structure would allow direct political control over the foundation's programs through the President.

In December 1945 Senator Kilgore introduced S. 1720, a revision of S. 1297. He introduced a compromise version of the new bill, S. 1850, in February 1946. It provided for an Administrator and an Advisory Board. The Senate passed S. 1850 on July 3, 1946, but the House failed to report a foundation bill out of committee.

Early in 1947, the new Republican leadership in the Senate gave floor responsibility for National Science Foundation proposals to Senator Smith of New Jersey, who was reportedly disposed to sympathize with the views of professors from private universities in the East.[8] With Dr. Bush's help, Senator Smith drafted S. 526, a bill that provided for a 24-member board which would elect a nine-member executive committee to exercise the powers and duties of the proposed Foundation, including the appointment of a Director and the delineation of his powers and duties. Despite Senator Kilgore's attempts at amendment, the bill, S. 526, was passed intact, due largely to the Republican majority in Congress. The amended version required geographic distribution, and gave the President power to appoint the Director, who would be supervised by the executive committee.

The bill was, however, pocket-vetoed by President Truman for reasons stated in a Memorandum of Disapproval dated August 6, 1947. In his message to Congress, President Truman noted that S. 526 had provisions which implied a "distinct lack of faith in democratic processes" and went on to point out that the bill would deprive him of effective means to discharge his contitutional responsibility for the reason that:

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[7] Bush, Vannevar. Science—The Endless Frontier; A Report to the President. Washington. U. S. Govt. Print. Off., 1945, pp. 25–34.

[8] Kevles, op. cit., p. 25.

> Full governmental authority and responsibility would be placed in 24 part-time officers whom the President could not effectively hold responsible for proper administration. Neither could the Director be held responsible by the President, for he would be the appointee of the Foundation and would be insulated from the President by two layers of part-time boards.

President Truman's veto highlighted the fact that from the introduction of the Kilgore and Magnuson bills in the 79th Congress down to the veto of the Smith bill, two philosophies relating to the nature and purposes of the proposed National Science Foundation had prevented the successful enactment of legislation.[9] On the one hand, there was the philosophy advocated by President Truman, his advisors, and many scientists that science is a "national resource" whose development through Federal support should be entrusted to an authority directly under executive branch and congressional control. The opposing philosophy, embodied in the Magnuson and Smith bills, sought the development of science with a maximum of autonomy in the hands of recognized leaders in science and industry. Many of the civilian scientists who had been involved in wartime research and development apparently felt that the latter, laissez-faire approach was the most efficient means to produce new basic scientific knowledge both as an end in itself and as an indirect means toward practical technological advancement in industrial, military, and medical fields. The conflict between these philosophies was highlighted by the debate over the administrative structure of the proposed foundation, particularly regarding the role of what was to become the National Science Board.

The laissez-faire approach embraced the position that the proposed foundation's Board should have the authority to set the policies of the foundation, as expressed by Vannevar Bush during hearings on the Kilgore and Magnuson bills in 1945:

> Science should be administered in the way which scientists have discovered through decades of experience to be the most productive of results. The form of administration contemplated [in the Magnuson bill] is based on broad and successful experience in the administration of scientific research. This form of organization will minimize the grave danger in a single director that a disproportionate amount of research effort will be channeled into one or two areas. . . . It is true that [the Kilgore bill proposes] an advisory board, but the director could ignore its advice at will. This is not a situation which will induce men of really high stature to serve upon such a board.[10]

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[9] See Study Group, Washington Association of Scientists (Federation of American Scientists). Science, v. 105, Oct. 24, 1947: 385–386.

[10] U.S. Congress. Senate. Committee on Military Affairs. Subcommittee on War Mobilization. Hearings on Science Legislation; S. 1297 and Related Bills. Hearings, 79th Congress, 1st session. October 8–12, 1945. Washington, U.S. Govt. Print. Off., 1945. p. 203.

Although Dr. Bush favored a strong Board, he was aware of "the difficulty that obtains in Washington when commissions carry on executive and administrative activities," and he clearly favored a Board whose responsibilities were strictly limited to executive policymaking.[11] The philosophy opposed to the laissez-faire approach embraced the position that the Board should be purely advisory, as expressed by President Truman in his Memorandum of Disapproval which accompanied his veto of S. 526:

> Adherence to the principle that responsibility for the administration of law should be vested in full-time officers who can be held accountable will not prevent the Government from utilizing with great advantages the services of eminent scientists who are available only for part-time duty. We have ample evidence of the patriotic and unselfish contributions which such citizens can make to the success of governmental programs. The role to be played by such part-time participation, however, is more appropriately one of an advisory nature rather than of full responsibility. In other governmental programs of vast national importance, this method is used to obtain advice and recommendations from impartial experts as well as from parties in interest. There is no reason why such a system cannot be incorporated in legislation establishing a National Science Foundation.

4. The "Steelman" Report

A similar position was maintained in a report presented to President Truman on August 27, 1947, from John R. Steelman, the chairman of the President's Scientific Research Board which was charged in 1946 with the task of studying Federal research programs, non-Federal research and development training facilities, and the interrelation of Federal and non-Federal research and development. The Steelman report recommended that the National Science Foundation "should be headed by a Director appointed by the President and assisted by a part-time advisory board of distinguished scientists and educators . . . drawn half from within the Government and half from the outside." [12]

5. Passage of 1950 NSF Act

The Senate passed a National Science Foundation bill, introduced in 1948 by Senator Smith, that met the President's objections. The House, however, did not act on the bill by the close of the 80th Congress. A dozen bills to create a National Science Foundation were introduced in 1949. Except for one which provided for an Administrator and an Advisory Board, all of the other bills provided for a National Science Board of 24 part-time members and a Director as chief executive officer, all to be appointed by the President with the advice and consent of the Senate. Both Houses finally agreed to an amended version of one of these bills, and on May 10, 1950, President Truman signed into law the National Science Foundation Act of 1950.[13]

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[11] Letters from Vannevar Bush to Dr. Isaiah Bowman (Jan. 31, 1947) and to James E. Webb, Director of the Bureau of the Budget (May 13, 1947), Bush MSS LC Box 85, file 1912.

[12] Steelman, John R., Science and Public Policy, Report to the President from the President's Scientific Research Board; Volume I: A Program for the Nation, Aug. 27, 1947. Washington, U.S. Govt. Print. Off., 1947, p. 34.

[13] Public Law 81–507, 64 Stat. 149, 42 U.S.C. 1861.

B. THE NATIONAL SCIENCE BOARD UNDER THE ORGANIC ACT OF 1950

The provisions of the National Science Foundation Act of 1950 most relevant to the National Science Board include the initial provision in section 2 that the "Foundation shall consist of a National Science Board . . . and a Director." Thus defined, the Foundation was authorized and directed to, among other things:

> Develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences through grants, contracts, and other arrangements;
>
> Initiate and support basic research in the sciences and in engineering;
>
> Award scholarships and graduate fellowships in the sciences and in engineering;
>
> Evaluate the scientific research programs undertaken by agencies of the Federal Government;
>
> Establish such special commissions as the Board may deem necessary; and
>
> Render an annual report to the President including, if any, recommendations and minority opinions of members of the Board.

Section 4 of the organic act dealt directly with the design and operation of the National Science Board:

> *Membership*
>
> (a) The Board shall consist of twenty-four members to be appointed by the President, by and with the advice and consent of the Senate, and of the Director ex officio, and shall, except as otherwise provided in this Act, exercise the authority granted to the Foundation by this Act. The persons nominated for appointment as members (1) shall be eminent in the fields of the basic sciences, medical science, engineering, agriculture, education, or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the views of scientific leaders in all areas of the Nation. The President is requested, in the making of nominations for persons for appointment as members, to give due consideration to any recommendations for nominations which may be submitted to him by the National Academy of Sciences, the Association of Land Grant Colleges and Universities, the National Association of State Universities, the Association of American Colleges, or by other scientific or educational organizations.
>
> *Term of Office*
>
> (b) The term of office of each voting member of the Board shall be six years, except that (1) any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term; and (2) [their terms of office shall be staggered in 2-year intervals, 8 members per term]. . . .
>
> *Meetings*
>
> (d) The Board shall meet annually on the first Monday in December and at such other times as the Chairman may

> determine, but he shall also call a meeting whenever one-third of the members so request in writing. A majority of the voting members of the Board shall constitute a quorum. . . .
>
> *Leadership*
>
> (e) The first Chairman and Vice Chairman of the Board shall be elected by the Board . . . for a term of two years. Thereafter such election shall take place at the annual meeting occurring at the end of each such term. The Vice Chairman shall perform the duties of the Chairman in his absence. In case a vacancy occurs in the chairmanship or vice chairmanship, the Board elects a member to fill such vacancy.

It is significant that section 4(a) of the Act granted all residual authority of the Foundation to the Board and not to the Director.

Section 5 of the organic act established that the Director of the Foundation shall be its chief executive officer, that he shall serve as a *nonvoting* ex officio member of the Board, and that he shall act only with the Board's approval:

> (b) In addition to the powers and duties specifically vested in him by this Act, the Director shall, in accordance with the policies established by the Board, exercise the powers granted by sections 10 and 11 of this Act, together with such other powers and duties as may be delegated to him by the Board; but no final action shall be taken by the Director in the exercise of any power granted by section 10 or 11(c) [relating to scholarships and fellowships and to grants, contracts, and other arrangements for the support of basic scientific research activities] *unless in each instance the Board has reviewed and approved the action proposed to be taken.* [Emphasis added.]

This section also prohibited the Board from delegating to the Director its approval authority for all Foundation support relating to scientific study and research.

Section 6 authorized the Board to appoint an Executive Committee, consisting of nine Board members, to serve two-year terms not to exceed six consecutive years, plus the Director as a *nonvoting* ex officio member. The Executive Committee was authorized to carry out all Board functions that are assigned to that Committee by the Board, except the functions of establishing policy and of approving grants and contracts, which were reserved to the full Board. This section also required that the Executive Committee be geographically representative and that it submit an annual report to the Board. It also authorized the Board to establish other committees that it deemed appropriate.

Sections 7 and 8 gave the Board authority to establish such divisions within the Foundation as necessary (although four divisions were initially provided for in the Act) and established advisory committees for each division to be appointed by the Board to "make recommendations to, and advise and consult with, the Board and the Director" regarding divisional programs.

Section 9 of the Act required that special commissions established by the Board to survey specific areas of research and to recommend research programs should consist of 11 Board-appointed members of whom only six were to be scientists.

C. THE EARLY NATIONAL SCIENCE BOARD: 1950–57

The first requirement of the National Science Foundation Act was the selection of Board members by the President according to the provisions of section 4(a). In fact, consideration of potential nominees for Board membership by interested parties such as Vannevar Bush and the National Academy of Sciences had begun as early as 1947.[14]

During the spring of 1950, when the selection process was well under way, White House officials considered, in addition to scientific and public affairs credentials, the question of adequate geographic representation as well as representation of women, blacks, and Catholics.[15] On November 2, 1950, the President announced 24 appointments to the Board (see chapter XI). Twenty of the appointees held college or university appointments, a slight majority of which were at private institutions. Seven of the appointees were university presidents and four were university vice presidents. Three members were presidents of large corporations, and one was the president of a large private foundation. Nine members represented the physical, mathematical, and engineering sciences, another nine the biological and medical sciences, although most were no longer active basic research scientists. There was good geographic representation among the Board members. The first Board also contained two women, two blacks, as well as Catholic representation, a pattern often followed through subsequent appointments. The eight members who were originally appointed for two-year terms expiring in 1952 were all reappointed by President Truman for full six-year terms in order to provide for initial stability in the Board as it tackled new policy and procedural problems.[16]

1. Operating Structure and Procedures

During the first five years of the Board's activity subsequent to the first meeting of the Board held in the White House on December 12, 1950, the Board met an average of seven times annually with an average attendance of almost 20 members.[17] The Board organized itself into working committees paralleling the various scientific disciplines supported by the Foundation, as well as into committees covering such operational areas as scientific personnel, education, and institutional programs. These committees generally met once per month. The potential for difficulty in sustaining a quorum of 12 members for every meeting of the full Board, as required under section 4(d) of the organic act, arose early in the Board's history. During congressional appropriations hearings in 1953 Director Alan T. Waterman made a proposal to amend section 4(d) to provide for a quorum of only eight members.[18]

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[14] England, J. Merton (NSF Historian), History of the National Science Foundation, draft manuscript. National Science Foundation, Feb. 1980; chapter six on Board and Director.

[15] Memorandum from William D. Carey (Bureau of the Budget) to S. R. Broadbent, April 3, 1950, National Archives, BOB MSS, Series 39.33, file 95.

[16] National Science Foundation. Second Annual Report, Fiscal Year 1952. Statement by Chester I. Barnard, Chairman, National Science Board, p. v–vi.

[17] U.S. Congress. House Committee on Appropriations. Subcommittee on Independent Offices. Independent Offices Appropriations for 1956. Hearings, 84th Congress, 1st session. Feb. 9, 1955. Washington. U.S. Govt. Print. Off., 1955. pp. 20–251. See also, National Science Foundation, Third Annual Report, Fiscal Year 1953, p. 59.

The proposed amendment was not reported out of the Senate Committee on Labor and Public Welfare because it considered the proposal to be inconsistent with the added responsibility that Committee sought to assign to the Foundation by eliminating the $15 million appropriations ceiling provided for in the 1950 organic act, which was accomplished in 1953.[19]

The compromise between the two opposed ideas on appropriate organization that were debated throughout the legislative history of the National Science Foundation Act produced an administrative structure that was somewhat peculiar for an executive agency. The Director was intended to be the chief executive officer of the Foundation with "purely administrative" responsibilities, while the part-time Board was to be the Foundation's policymaking body. The operational distinction, however, between policymaking and administration is not precise, and hence the actual and appropriate division of authority between the Board and the Director has been repeatedly scrutinized both within NSF and by Congress.

While the Director's function under the 1950 organic act was to carry out the policies adopted by the Board, in the making of grants and contracts it was only in the case of those relating to basic scientific research activities (and those undertaken at the request of the Secretary of Defense) that the Act imposed a legal obligation upon the Director to secure the specific approval of the Board. Thus, in the early years, except for basic scientific research activities and specific cases where a new policy matter appeared to be present, once a policy was established by the Board (for example, to experiment with summer institutes or to undertake a program in the area of science education or scientific information) the Director was free to, and largely did, go ahead with making grants and contracts without recourse to the Board. The Director did, however, report to the Board on the general activities underway pursuant to all Foundation funding as well as on questions of legislation and general policy which were always deemed matters for Board consideration.[20]

The relationship between the Director and the National Science Board during this early period, and indeed for all the period of its operation to the present day, has generally been described in favorable terms. But such accord generally has been noted to be the case despite NSF's "peculiar, two-headed" administrative structure rather than because of it.[21] For example, Chester I. Barnard, the second Board Chairman, wrote in the Foundation's Fifth Annual Report (1955): "During the 5 years of its work this peculiar organization, depending upon cooperation between the Board and the Director, has worked exceedingly well." One member who served on the Board for 12 years described the relationship between the Board and the first two Directors as one of harmony and "splendid cooperation," commenting further that "of all the various boards I have had the privilege of serving on, there is none which has operated with as much amity and accord and real discussion and consideration of basic policy than the National Science Board." [22] According to NSF's second Director, the Board and Director operated in a "close and harmonious partnership . . . from the beginning." [23]

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[18] It is important to realize that the interest of the 24 members of the National Science Board in the work of the Foundation has been so great that, to date, no actual case of failure to obtain a quorum, or the loss of a quorum after a meeting has started, has occurred. Attendance at Board meetings during the two active years of the Foundation's life had averaged almost 20. At several meetings, however, early departure of members required by transportation schedules, sudden illness, and similar factors, has pointed up the possibility that the quorum might on occasion be lost. This could be particularly troublesome for the Foundation since the act requires that the final action in each case of a grant for basic research of the award of a scholarship or fellowship be reviewed and have the approval of the Board. It is the risk of a delay of 6 weeks to 2 months in these programs that this amendment would minimize The proposal has been considered by the Board and has its unanimous approval. (U.S. Congress. House. Committee on Interstate and Foreign Commerce. National Science Foundation (Quorum and Appropriation). Hearings, 83rd Congress, 1st session. May 6, 1953, on H.R. 4689. Washington, U.S. Govt. Print. Off., 1953. p. 2.)

[19] Public Law 83–223. August 8, 1953. See U.S. Congress. Senate. Committee on Labor and Public Welfare. Report to accompany S. 997. Washington, U.S. Govt. Print. Off., 1953 (83rd Congress. 1st session. Senate Report No. 83–396) p. 3.

[20] Hoff, William J. (former NSF General Counsel). The National Science Foundation: Board and Director; a study prepared for the National Science Foundation, May 28, 1976. (Hereafter referred to as the Hoff Report, 1976) pp. 4–5.

2. National Science Foundation Policy

The Board was launched quickly into the task of formulating programmatic policy for the Foundation. The second monthly Board meeting was marked by opposition to a Budget Bureau recommendation that a Scientific Advisor to the President be created in the interest of science mobilization for the Korean War. Confronted with this opposition, the Budget Bureau responded with a statement to all Board members that "the National Science Foundation should confine its activities to furthering basic scientific studies and . . . should not dilute its effectiveness by supporting studies of directly military or other applied character." [24] The Board finally withdrew its opposition to what became the President's Science Advisory Committee (PSAC) but it retained the position that NSF had an important defense-related mission in providing the Nation with an adequate supply of trained scientists and engineers. To this end, a postgraduate fellowship program was "placed high on the list of priorities by the National Science Board." [25] In its first annual report, the Board also flatly rejected the Budget Bureau's contention that NSF should not support applied research, maintaining that no one can draw a sharp line between basic and applied research and the Foundation would support many investigations that might be classified in one area or the other.[26]

Very early in its deliberations, the National Science Board considered what type of awards the Foundation would make as a matter of operating policy. The Board elected to support individual scientific projects along the lines of the technique followed by the Office of Naval Research, which was in some respects a pattern for the Foundation in its early years.[27] Project grants were made in 11 scientific fields, which initially did not include the social sciences. In 1953 the Foundation began to study what its proper role might be with respect to the social sciences. In 1954 the Board approved a limited program of support for social science research and added an ad hoc committee on Social Sciences to advise NSB on possible extensions to social science programs. Support for large-scale and expensive research facilities was initiated subsequent to a 1955–56 NSF study which culminated in a report entitled *Federal Support of Physical Facilities and Major Equipment for the Conduct of Scientific Research* (June 1957). Other early NSF policies that the Board was involved in developing related to graduate fellowships, conferences and institutes, projects on science education and course content improvement, international science programs, science information, and science manpower.

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[21] Wolfle, Dale. National Science Foundation: The First Six Years. Science. v. 126, Aug. 1957: 335–343.

[22] U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research and Development. Government and Science; Review of the National Science Foundation. Hearings, 89th Congress, 1st session, June–August 1965. Washington, U.S. Govt. Print. Off., 1965, p. 472; testimony of Rev. T. Hesburgh. (Hereafter referred to as Government and Science, Hearings, 1965)

[23] National Science Foundation. 15th Annual Report, 1965, p. x.

[24] Bronk, op. cit., p. 11.

[25] National Science Foundation. First Annual Report, 1950–51. Statement of James B. Conant, Chairman, National Science Board, p. vii. NSF Historian, M. England, reports, however, that the Director and Board insisted that NSF's role was only in basic research, despite this statement. (written communication).

[26] Ibid., p. vi.

[27] Wolfle, op. cit., p. 337.

3. National Science Policy

The Foundation's First Annual Report gave substantial consideration to the development of national policy for basic research and education in the sciences, and outlined questions related to this task:

> What is the total financial support now being provided for scientific research?
>
> What is the distribution of this support among the three major sources—Government, industry, and educational institutions?
>
> What amount of financial support can and should be provided and what is the most desirable distribution from among the available sources of support?
>
> What is the division of research effort among the various natural sciences?
>
> What areas need greater emphasis and what less?
>
> What means can be developed to shorten the period between discovery and practical application?
>
> What are the present and future needs for trained scientific manpower?
>
> What is the impact of Government support of research programs on the educational process in universities and colleges?
>
> What is the effect of Federal research programs on the financial stability of universities?

In 1953 NSF began to gather information on such topics as national R. & D. expenditures, science and engineering manpower, and materials policy. The development of such information became a major Foundation activity supporting the development of national science policies by the Board. The Foundation, however, deliberately chose to get its operating programs started first and not to devote much of its energies to national science policy matters until it had established its position in the scientific world.[28]

The National Science Board and the Director soon sought to define more specifically NSF's role in relation to other agencies. After extensive conferences between NSF, the Bureau of the Budget, and other agencies, the Foundation made a series of recommendations which were incorporated into Executive Order 10521 of March 17, 1954.[29] The Executive Order [30] broadened the scope of the Board's policy-making responsibilities by providing:

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[28] Ibid., p. 339.

[29] Waterman, Alan T. National Science Foundation: A Ten Year Resume. Science, v. 131, May 1960: 1341–1353.

[30] 19 FR 1499, Mar. 19, 1954.

> Section 1. The National Science Foundation . . . shall from time to time recommend to the President policies for the Federal Government which will strengthen the national scientific effort and furnish guidance toward defining the responsibilities of the Federal Government in the conduct and support of scientific research. . . .
>
> Section 3. The Foundation . . . shall review the scientific research programs of the Federal Government in order, among other purposes, to formulate methods for strengthening [their] administration, . . . shall recommend to the heads of agencies concerning the support given to basic research.

Despite its broadened authority, the Foundation did not provide overall leadership with respect to Federal budgets or policies for science. While the Foundation issued various specialized reports and increasingly collected and published statistical reviews such as *Federal Funds for Science*, it did not seem to become an effective coordinator of Federal science programs and generally refrained from expressing views on the programs and budgets of its sister agencies. According to the first Director of NSF:

> By the decision of the Director and the National Science Board, the National Science Foundation has always interpreted its evaluation function to consist in the study and evaluation of the programs in support of basic research undertaken by agencies of the Federal Government as a whole, and, in particular, by fields of science rather than by agencies . . . It has been considered inappropriate by the Foundation to evaluate the research programs of particular agencies unless so requested by the agency.[31]

The Board, however, did originate several policies which provided effective guidance for the conduct of Federal research programs. In 1954, the Board established a policy regarding loyalty evaluation as related to NSF support of nonclassified scientific research. After the National Academy of Sciences endorsed the policy, the President promulgated a policy similar to the Foundation's loyalty policy as guidance to all Federal agencies.[32] The Board organized a Special Commission on Rubber Research in 1955 which, through its recommendations, effected the dismantling of the Federal synthetic rubber effort. The Board also was involved, by request of the Budget Bureau and with assistance from two advisory committees, in examining the need for a uniform Federal policy on the treatment of indirect costs for supported university research. Such a policy was developed in 1955 and formed the basis of the 1958 NSF report, *Government-University Relationships in Federally Sponsored Scientific Research and Development.* Another policy recommended by the National Science Board involved providing certain Federal agencies grant authority to support scientific research and to vest title to research equipment in the grantee, implemented by the enactment of P.L. 85–934 on September 6. 1958.[33]

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[31] U.S. Congress. Committee on Government Operations. Subcommittee on Executive and Legislative Reorganizations. Reorganization Plan No. 2 of 1962. Hearing, 87th Congress, 2d session. April 17, 1962. Washington, U.S. Govt. Print. Off., 1962. p. 25.

[32] Government and Science, Hearings, 1965, p. 971.

[33] Ibid.

D. POST-SPUTNIK REFORMS

After Sputnik was launched by the Soviet Union on October 4, 1957, the executive branch initiated a series of steps designed to foster science and technology in the United States by effectively coordinating R & D activities in the Federal Government. Several of these measures affected the structure and functions of the National Science Board.

1. Executive Order 10807: the Federal Council for Science and Technology

In November 1957, President Eisenhower transferred the Science Advisory Committee from the Office of Defense Mobilization to the White House. One year later the President's Science Advisory Committee issued a report, *Strengthening American Science*, which recommended the establishment of a Federal Council for Science and Technology (FCST) to promote closer cooperation among Federal agencies in planning their science and technology programs. Such a Council was created in 1959 by Executive Order 10807.[34] The new Council was given the primary responsibility for Federal R & D coordination and policy development, thus replacing NSF in the expanded role the Foundation had been given by Executive Order 10521. Executive Order 10807 cut back the expanded role of the Foundation to the original congressional specification of basic research and science education by amending section 1 of the earlier 1954 order to read:

> The National Science Foundation . . . shall from time to time recommend to the President policies for the promotion and support of basic research and education in the sciences, including policies with respect to furnishing guidance toward defining the responsibilities of the Federal Government in the conduct and support of basic scientific research.

The Foundation put a great deal of effort into supplying the Federal Council for Science and Technology with information, studies, reports, and ideas for policy consideration as well as furnishing staff for its committees, but there was only minimal involvement by the National Science Board in this effort.[35]

2. Public Law 86–232: Relaxation of the Board's Project Approval Requirements

One of the Federal responses to the Sputnik launch was greatly increased research and development spending, and this was reflected in congressional appropriations for NSF. For the years 1951 through 1956, NSF authorizations increased from an initial $225,000 to $16 million. For 1957 and 1958, authorizations for NSF were in the $40 million range. NSF authorizations increased to $136 million for the year 1959. By 1962 over $250 million had been authorized for NSF expenditures, and NSF spent over a half billion dollars in 1967.

The dramatic increases in NSF authorizations beginning in 1959 had a great impact on the operations of the National Science Board. With an increased budget the Board had to review and approve an increased number of fellowships, scholarships, and basic science research grants and contracts in accordance with section 5(b) of the National Science Foundation Act. The rigid requirement of prior approval that section 5(b) imposed on the Board was originally intended "to prevent political influences operating within the Executive Branch from controlling the allocation of grants and contracts in a manner hostile to the interests of the scientific and educational community."[36] But the Board and the Director apparently believed that the rigidity of section 5(b) was beginning to detract from the Board's effectiveness. In 1958, NSF Director Alan Waterman testified before Congress in support of an amendment to the 1950 organic act that would relax the prior approval requirements of section 5(b):

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[34] Executive Order 10807, Mar. 13, 1959; 24 FR 1897.
[35] Hoff Report (1976), op. cit., p. 14.

> [The amendment would] authorize the National Science Board to delegate specific authority to its Executive Committee or to the Director to approve grants or contracts. . . . At the present time the Board must approve the award of each fellowship and each grant or contract for basic research. This rigid requirement has posed problems for efficient operation in several instances where time was of the essence. With the greatly increased load on the Foundation, this proposed amendment has become a necessity.[37]

The amendment, enacted into law in 1959,[38] contained a section 5(b) which released the Board from the original prior approval requirement in all cases where the Director's action "is taken pursuant to the terms of a delegation of authority from the Board or the Executive Committee to the Director." The 1959 Act also amended section 6 of the 1950 organic act to allow the Executive Committee, upon delegation of authority from the full Board, to undertake review and approval functions in accordance with the amended section 5(b). However, the Board was barred from assigning to the Executive Committee the function of establishing policies. The revised section 6 provided for a smaller Executive Committee of between five and nine members who, as before, would be elected by the Board from among their number with the Director as a nonvoting ex officio member.

The Board's new delegation authority was implemented immediately through an interim delegation of approval authority to the Director for "emergency grants and contracts not establishing policy up to $100,000."[39] Less than two months later the Board approved broader delegation terms allowing the Director to take final action on awards of up to $250,000 which did not involve policy:

> The Board unanimously hereby DELEGATES to the Director authority to review, approve, and take final action with respect to individual grants and contracts where the amount to be provided by the Foundation under any such grant or contract is less than $250,000 and where such proposed grants or contracts do not involve policy considerations of the nature

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[36] National Science Foundation. National Science Board. Report of the *Ad Hoc* Committee on the Relationship Between the National Science Board and the Director, approved by the National Science Board Dec. 1, 1958, p. 4. (Hereafter referred to as the Middlebush Report, 1958.)

[37] U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Health and Science. National Science Foundation. Hearing, 85th Congress, 2d session. May 14, 1958. Washington, U.S. Govt. Print. Off., 1958. p. 99.

[38] P.L. 86–232, Sept. 8, 1959, 73 Stat. 467.

[39] National Science Board. Approved Minutes of the 61st Meeting of the National Science Board, Aug. 27–28, 1959.

> which must be passed on by the National Science Board in accordance with the National Science Foundation Act. . . .[40]

The Director also was given authority to approve all fellowships, was required to report to the Board on all approvals he made, and was instructed to seek Board approval for programs which involved a number of component parts.[40] In 1964 the Board increased its delegation of approval authority to the Director for projects involving policy considerations reserved to the Board.[41] The 1964 delegation enabled the Director to take final action on projects that either (1) entailed an annual cost of $500,000 or less and totaled less than $2 million, or (2) were for the construction of a research facility costing $1 million or less. In addition to the delegations of 1954 and 1959, the Board also delegated to the Director the authority to take final action during fiscal years 1962–1968 on a number of continuing programs and special projects whose costs exceeded the dollar limits contained within the delegations of 1959 and 1964, although the former delegations usually contained the restriction that those awards raising policy issues were to be brought to the Board for approval. For instance, in 1961 the Board made one such delegation for three continuing programs; it made five such delegations in both 1962 and 1963 and one in 1965. As a result of such delegations, the full Board acted on only approximately 50 individual actions each year during the early and mid-1960s.[42]

Besides delegating authority, another way that the Board coped with the increased workload created by increased NSF budgets was to place more reliance upon its Board committees and the standing NSF Divisional Committees for the generation of information and policy suggestions. Through increased access to Divisional Committee meetings and through the ties that Divisional Committee members had to the scientific community, these standing committees of the Foundation became an invaluable arm of the Board during the period 1960–1965.[43]

3. *Reorganization Plan No. 2 of 1962: Strengthening the Director's Role*

The continuing effort to strengthen U.S. science and technology in the early 1960s resulted in attempts to centralize science policy control within the executive branch. One measure taken was the creation of the Office of Science and Technology within the Executive Office of the President through President Kennedy's Reorganization Plan No. 2 of 1962.[44] At the time of this reorganization, NSF still retained the functions of (1) coordinating Federal activities in the area of basic research and education in the sciences and (2) evaluating scientific research programs undertaken by agencies of the Federal Government. Reorganization Plan No. 2 transferred these functions from NSF to the new Office of Science and Technology. The President explained these transfers in his message to Congress accompanying the reorganization plan:

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[40] National Science Board. Approved Minutes of the Meeting of the National Science Board, Oct. 12–13, 1959.

[41] National Science Board. Approved Minutes of the Meeting of the National Science Board, Sept. 1964.

[42] Government and Science. Hearings (1965), op. cit., p. 972.

[43] Middlebush Report (1958), op. cit., p. 11–12. National Science Board. Approved Minutes of the 68th Meeting of the National Science Board. December 1960. "Discussion of the Functions of the Divisional Committees." Government and Science. Hearings (1965), op. cit., p. 569, 1329–1330.

[44] 27 FR 5419, June 8, 1962; accompanied by a Message from the President of the United States, Congressional Record, v. 108, Mar. 29, 1962: 5439.

> . . . the Foundation, being at the same organizational level as other agencies, cannot satisfactorily coordinate Federal science policies or evaluate programs of other agencies. Science policies, transcending agency lines, need to be coordinated and shaped at the level of the Executive Office of the President drawing upon many resources both within and outside of Government. Similarly, staff efforts at that higher level are required for the evaluation of Government programs in science and technology.

Reorganization Plan No, 2 also reestablished the National Science Board's Executive Committee and gave it, for the first time, a mandatory legal status. The Executive Committee was now to consist of the Director, as a *voting* ex officio member who would also serve as Chairman, and four other voting members elected by the Board for two-year terms not to exceed six consecutive years. The requirement of geographic representation within the Executive Committee was dispensed with under this reorganization plan.

Reorganization Plan No. 2 clearly strengthened the Director's position vis-a-vis the Board through its reconstitution of the Executive Committee. The Director's position was further enhanced since the plan relieved divisional committees of the requirement that recommendations be made to the Board. Thus, while these committees were still to be appointed by the Board, they would henceforth legally report to the Director. The Director also was made eligible explicitly for election as Chairman or Vice Chairman of the Board. In order to strengthen further the Director's role, the Executive Branch at the time of the 1962 reorganization even considered making the Board a purely advisory body, as recommended by the President's Science Advisor Jerome B. Wiesner:

> We [in the President's Science Advisory Committee (PSAC)] recommended during the development of Reorganization Act No. 2, that the Board be made policy advisor and that all of the operating responsibilities be given by law directly to the Director, rather than being delegated by the Board. Several Board members objected with sufficient violence and with a sufficient number of arguments that I concluded that they might be right and I didn't pursue it. I still think this is a point worth considering and examining.[45]

The National Science Board issued a statement in November 1961 opposing the PSAC recommendation:

> . . . The Board has delegated to the Director authority for the award of all grants excepting those of the largest amounts. That limited authority was reserved to the Board in order to ensure that it would counsel with the Director on large undertakings which were likely to involve the setting of policies and precedents. In no instance has there been an unresolved difference of opinion between the Director and the Board. . . . Policies and actions recommended by advisory committees are seldom adopted when they do not conform to the beliefs and wishes of the agency's administrator. . . . It is doubtful

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[45] Government and Science, Hearings (1965), op. cit., p. 663.

> whether many leaders in science and education would feel able to give of their time and effort to the extent they have if the Board were to have mere perfunctory advisory functions.[46]

The Board discussed the White House proposal to change the status of the Director vis-avis the Board in executive session on March 15, 1962, and, repeating the gist of the November statement, agreed that "it would be unfortunate to reduce the size of the Board, change their term of office, or to reduce the Board to an advisory board only," principally for the reason that Board members "would probably not have given so freely of their time and effort if they had been serving only in an advisory capacity." [47] There was support, however, among some Board members for a purely advisory National Science Board.[48]

4. Continuation of Reorganizations in 1965

Reorganization Plan No. 5 of 1965 [49] authorized the Director of the National Science Foundation to delegate any of his functions, including any functions delegated to him by the National Science Board, to any other Foundation officer. The reorganization plan also abolished the divisional committees established under section 8 of the National Science Foundation Act of 1950. At that time, NSF Director Leland J. Haworth explained that divisional committees were abolished because of a need for flexibility given the growing number of NSF divisions and their interrelated activities.[50] However, some members of the Board apparently believed that divisional committees were of value, particularly in serving as an important communications link between the scientific community and the Board.[51] Since Reorganization Plan No. 2 of 1962 removed the divisional committees from the jurisdiction of the Board, the Board had no chance in 1965 to vote on the desirability of their statutory basis. Subsequent to Reorganization Plan No. 5 of 1965, the divisional committees were replaced by a system of Advisory Committees whose members were appointed by the Director under his general authority to appoint consultants. In practice, the Director consulted with the Board and sought its advice before naming persons to these committees, shared advice obtained through the committees, and arranged for annual presentations by the committees to the Board.[52]

As a further measure to secure a broader viewpoint in coordinating and integrating the various programs of the Foundation, the Director requested in 1965 that the Board abolish its working committees, which paralleled the various scientific disciplines receiving NSF support, and replace them with three major committees focusing respectively on NSF programs, NSF operations and administration, and national science policy and planning.[53] The Board implemented the requested changes in 1965.

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[46] National Science Board. Approved Minutes of the Meeting of the National Science Board, Nov. 1961.

[47] Government and Science, Hearings (1965), op. cit., p. 1333.

[48] Ibid., p. 1414, 1420.

[49] 30 FR 9355, July 28, 1965.

[50] National Science Foundation. 16th Annual Report, 1966, p. xxiv.

[51] Walker, Eric A. National Science Board: Its Place in National Policy. Science, v. 156, Apr. 28, 1967: 474–477. See also Government and Science, Hearings (1965), op. cit., pp. 1329–1330.

[52] Hoff Report (1976), op. cit., p. 17.

[53] National Science Foundation. 15th Annual Report, 1965, pp. xi–xii. See also U.S. Congress. House. Committee on Appropriations. Subcommittee on Independent Offices. Independent Offices appropriations for 1966. Hearing. 89th Congress, 1st session. Mar. 23, 1965. Washington, U.S. Govt. Print. Off., 1965, pp 549–550.

E. THE DADDARIO LEGISLATION OF 1968 (P.L. 90–407)

Late in 1964, pursuant to a directive from the Chairman of the House Committee on Science and Astronautics, Representative George P. Miller of California, its Subcommittee on Science, Research, and Development, chaired by Representative Emilio Q. Daddario of Connecticut, began a comprehensive review of the National Science Foundation and its operations. At that time, the subcommittee arranged with the newly formed Science Policy Research Division of the Library of Congress to prepare a background report on the Foundation. The report, completed and submitted to the subcommittee in May 1965,[54] served as the basis for extensive hearings before the Daddario subcommittee in 1965.[55] In December 1965, the subcommittee issued a report, entitled *The National Science Foundation—Its Present and Future*, which served as a basis for further hearings and legislative proposals during 1966 and 1967. Legislation amending the National Science Foundation Act of 1950 submitted by Mr. Daddario was finally enacted in July 1968, becoming P.L. 90–407.[56] Through this act the Congress seemed anxious to strengthen the National Science Board's policymaking role, and the role of the Director as chief executive officer. It also seems that the Congress wanted to reinstitute in the Foundation some of the functions transferred to the White House by Presidents Eisenhower and Kennedy in actions discussed above.

The following is a summary and analysis of those sections of P.L. 90–407 which altered the structure and functions of the National Science Board as these were defined previous to the enactment of this legislation.

1. Board Membership and Organization

The qualifications for Board membership were changed slightly by the "Daddario" legislation. The original requirement that nominees for Board appointment should be eminent in the fields of basic or medical science, engineering, agriculture, education, or public affairs was expanded to include explicit reference to the social sciences and research management.

The 1968 act specified that the election of Chairman and Vice-Chairman of the Board should take place at each annual meeting occurring in an even-numbered year.

The 1968 act also provided that the Board should have an Executive Committee as provided in Reorganization Plan No. 2 of 1962. Under the new act, however, the Board would have the authority to delegate to the Executive Committee (or to the Director or to both) those powers and functions granted to the Board as it deemed appropriate, thus removing the restriction against the delegation of policy functions by the Board which had been in effect since 1959. This change was intended to aid and expedite actions where rapid policy decisions or approvals are needed.[57] The 1968 act gave the Director authority, with the concurrence of a majority of Board members, to permit the Director to appoint a five-member professional staff to the Board. It was intended that staff for the Board would provide administrative support and would not serve as advisors to the Board in its policy determinations.[58]

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[54] U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research, and Development. The National Science Foundation: A General Review of its First 15 years. Report prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress. 89th Cong., 2d Sess. Washington, U.S. Govt. Print. Off., 1966. p. 286.

[55] U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research, and Development. Government and Science: Review of the National Science Foundation (2 vols.). Hearings, 89th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1965. p. 1494.

[56] P.L. 90–407, July 18, 1968, 82 Stat. 360.

2. Annual Report

A new function that the "Daddario" legislation assigned to the Board (which, in part, justified enabling the Board to hire staff) was that of rendering an annual report to the President for submission to the Congress on the status and health of science and its various disciplines. Congress did not intend for these annual reports to be comprehensive with respect to all aspects of technology or science education. Rather, it was intended that the Board report selectively on the most timely and significant characteristics, developments, or deficiencies in the areas of its responsibilities.[59]

3. Division of Authority Between the Board and Director

The Daddario legislation significantly altered the division of authority between the Board and the Director. While specifying that "In addition to any powers and functions otherwise granted to it by this Act, the Board shall establish the policies of the Foundation," the 1968 Act went on to specify that "Except as otherwise specifically provided in this Act . . . the Director shall exercise all of the authority granted to the Foundation by this Act (including any powers and functions which may be delegated to him by the Board) . . ." Thus, the basic relationship between the Board and the Director established in 1950 was reversed by the 1968 Act since this act vested all residual authority of the Foundation in the Director instead of the Board. The Director's position vis-a-vis the Board was further strengthened through (1) the replacement of section 7 of the 1950 Act with the provision that "There shall be within the Foundation such Divisions as the Director, in consultation with the Board, may from time to time determine," and (2) the new provision that "The formulation of programs in conformance with the policies of the Foundation shall be carried out by the Director in consultation with the Board."

The Director's authority to delegate duties and powers as deemed appropriate, originally granted by Reorganization Plan No. 5 of 1965, was retained in the "Daddario" legislation. However, the 1968 Act imposed the new restriction that the Director shall not redelegate any policymaking functions granted by the Board. This restriction was intended to ensure that the Board retained basic responsibility for policy formulation.[60]

Although P.L. 90–407 assigned to the Board the function of establishing NSF policies, both the Board and Congress recognized that the boundary between administration and policymaking is not always clear. At its 111th meeting in March 1967, the National Science Board adopted a position on the meaning of policy in the National Science Foundation Act. It defined the policy questions reserved to the Board as being those questions relating to (1) the formulation and modification of NSF programs and budgets. (2) NSF positions on major legislation, (3) NSF conduct which might arouse substantial public or congressional interest, and (4) recommendations regarding national or Federal science policy. Congress addressed this issue in several provisions of P.L. 90–407 in which it ensured Board participation in such essential aspects of Foundation administration as program formulation and the creation of NSF Divisions. In addition, the legislation restricted the Board's authority to delegate to the Director its function of approving grants, contracts, and other arrangements relating to the Foundation's scientific activities, as set out in section 5(e) of the 1950 Act as amended by P.L. 90–407.

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[57] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Act Amendments of 1968; Report to Accompany H.R. 5404. Washington, U.S. Govt. Print. Off., 1968 (90th Cong., 2d Sess., Senate. Report No. 90–1137). p. 19.

[58] Ibid., p. 17.

[59] Ibid., p. 16.

[60] Ibid., p. 17.

The legislative history of the new section 5(e) created by the 1968 amendment to the 1950 organic act points out some of the central issues regarding the appropriate division of responsibilities between NSF's Board and Director as viewed from Foundation and congressional perspectives. The background report transmitted in late 1965 to the House Committee on Science and Astronautics from the Subcommittee on Science, Research, and Development, chaired by Representative Daddario, contained a number of recommendations for amending the National Science Foundation Act of 1950, including the suggestion to modify the existing authority of NSB with regard to the certification of major grants and programs so that such authority need be exercised only in cases of disapproval [p. 110].

Mr. Daddario subsequently introduced H.R. 13696 (89th Congress, 2d session) amending the 1950 organic act to include a new section 5(d) which, contrary to the above recommendation, would have split the authority to approve awards between the Board and the Director as follows:

> (d) The Director shall not make any contract, grant, or other arrangement pursuant to section 11(c) [relating to NSF scientific activities] without the prior approval of the Board if such contract, grant, or other arrangement involves a new program, or involves a total commitment of over $2,000,000, or over $500,000 in any one year, or a total commitment of such higher amount or amounts or subject to such other conditions as the Board in its discretion may determine and publish in the *Federal Register*.

This proposed section 5(d) was based on the actual arrangement that had developed between the Board and the Director since the Board was first authorized to delegate its functions through the enactment of P.L. 86–232 in 1959. However, during hearings on H.R. 13696 the National Science Board criticized the proposed section 5(d) on the grounds that NSB guidance should focus on policy and program development, not on individual awards:

> The proposed requirement for Board approval of all commitments in excess of a specified amount is, indeed, a description of current practice. This practice evolved over the history of the Foundation as, with an expanding number of

> transactions. the part-time Board could address itself to an ever-diminishing fraction of the total. But the practice lacks a compelling logic. Awards involving large sums are studied closely, not only by the Director and his Staff but by panels of well-qualified experts. In a general way, the larger the sum, the closer and more intense the scrutiny, and the more cautious the approach. The technical judgment, however, is rendered by the panel of experts in any case. If the terms and conditions of the program from which such an award is to be made have been clearly set forth by the Board, then problems of *policy* are no more likely to arise in the award of large sums than in the award of lesser sums. And it is to such problems that the Board should address itself with respect to the ongoing operations of the Foundation.[61]

NSF Director Leland J. Haworth concurred with the Board and testified at the hearings that he believed "the limitations on the day-to-day actions of the Director contained in the section 5(d) constitute an inappropriate division of authority between the Board and the Director." [62]

In May 1966. after the hearings, Mr. Daddario introduced H.R. 14838, a modified version of his earlier bill containing a revised proposed section 5(d):

> (d) The Director shall not make any grant, contract, or other arrangement pursuant to section 11(c) [relating to NSF scientific activities] without the prior approval of the Board if such contract, grant, or other arrangement involves a new *type of* program, or involves a total commitment of over $2,000,000, or $500,000 in any one year, or a commitment of such *other* amount or amounts and subject to such other conditions as the Board in its discretion may determine and publish in the *Federal Register*. [New language in italic.]

The revised section 5(d) language essentially would not have changed the responsibilities and procedures of the Board that had been in effect since 1959. The Board and the Director nevertheless objected to the revised section 5(d) language, stating in a letter to the Chairman of the House Committee on Science and Astronautics that they felt that "the Board should not be involved in the approval of individual transactions." [63] The House passed H.R. 14838 in July 1966.

After the Senate failed to act on H.R. 14838 in the 89th Congress, Mr. Daddario reintroduced his bill with very few changes in February 1967 as H.R. 5404. The proposed section 5(d) in H.R. 14838 was retained and redesignated section 5(e) in H.R. 5404, a new section

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[61] U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research, and Development. A bill to amend the National Science Foundation Act of 1950. Hearings, 89th Congress, 2d Sess., Apr. 19–21, 1966, on H.R. 13696 superceded by H.R. 14838. Washington, U.S. Govt. Print. Off., 1966, p. 92. (Hereafter referred to as Hearings on H.R. 13696, 1966.)

[62] Ibid, p. 26.

[63] U.S. Congress. House. Committee on Science and Astronautics. Amending the National Science Foundation Act of 1950; Report to Accompany H.R. 14838. Washington, U.S. Govt. Print. Off., 1966 (89th Congress, 2d Sess., House. Report No. 89–1650), pp. 34–35.

5(d) having been inserted which provided that the "formulation of programs in conformance with the policies of the Foundation shall be carried out by the Director in consultation with the Board." While approving of the new section 5(d), the NSF Board and Director continued to criticize the retention of the language now in section 5(e), stating in another letter to the Science and Astronautics Committee:

> The Board has determined that this limitation is both unnecessary and undesirable . . . the approval of individual transactions within established policies is, we feel, a matter for the chief executive officer of the Foundation—the Director . . . regardless of the dollar amount, unless such transation or measure raises a policy question of the nature reserved to the Board.[64]

The House passed H.R. 5404 in April 1967. The bill was referred to the Senate Committee on Labor and Public Welfare where it was considered by a Special Subcommittee on Science chaired by Senator Edward Kennedy along with S. 2598, a bill introduced in October 1967 by Senator Kennedy. S. 2598 was similar to H.R. 5404, but it incorporated several changes suggested by the Executive Branch and by private citizens. Supported by the NSF Board and Director, the proposed section 5(e) in S. 2598 transferred grant and contract approval authority for NSF's scientific activities to the Director without reference to dollar limits, except in those cases involving policy decisionmaking reserved to the Board. During hearings on the House and Senate bills before the Kennedy subcommittee, Mr. Daddario countered the objections of the NSF Board and Director in his testimony in support of the House version of section 5(e):

> We think that the Board can and should have the time and the ability to approve programs over these amounts. . . . Once approved the Director has the responsibility to carry them out. This is how it has worked. This is the relationship they have developed. All we are doing is taking that practical experience and doing what we think to be a very logical thing that is to invoke it into law.[65]

After the hearing, the Kennedy subcommittee met in executive session in February 1968 and decided to report an amended version of H.R. 5404 which the House accepted. As it finally appeared in P.L. 90–407, the agreed upon language for the proposed section 5(e) was the following:

> (e) The Director shall not make any contract, grant, or other arrangement pursuant to section 11(c) [relating to NSF scientific activities] without the prior approval of the Board, except that a grant, contract, or other arrangement involving a total commitment less than $2,000,000, or less than $500,000

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[64] U.S. Congress. House. Committee on Science and Astronautics. Amending the National Science Foundation Act of 1950; Report to Accompany H.R. 5404. Washington, U.S. Govt. Print. Off., 1967. (90th Cong., 1st Sess., House. Report No. 90–34), pp. 35–36.

[65] U.S. Congress. Senate. Committee on Labor and Public Welfare. Special Subcommittee on Science. National Science Foundation Act Amendments of 1968. Hearings, 90th Congress, 1st Sess., Nov. 15–16, 1967, on S. 2598 and H.R. 5404. Washington, U.S. Govt. Print. Off., 1968, p. 116.

> in any one year, or a commitment of *such lesser amount or amounts* and subject to such other conditions as the Board in its discretion may from time to time determine to be appropriate and publish in the Federal Register, may be made if such action is taken pursuant to the terms and conditions set forth by the Board, and if such action is reported to the Board at the Board's next meeting following such action. [Italics added.]

Because the final version of section 5(e) referred to "such lesser amount or amounts," as opposed to H.R. 5404's reference to "such other amount or amounts," the bill enacted had the effect of limiting the Board's power of delegation as it had existed since 1959. This additional restriction, which was not in accordance with the earlier proposals of either the Board, Senator Kennedy, or Mr. Daddario, was explained in the following way in the report accompanying the enacted legislation:

> The Director is required to secure the prior approval of the Board before awarding grants or contracts pursuant to Sec. 11(c), except to the extent that the Board sets conditions for the delegation of commitments of amounts less than $2 million or less than $500,000 in any one year. . . . While the committee recognizes that the Board may wish to have the Director take responsibility for each individual transaction, and may therefore wish to provide for him to do so, it feels nevertheless that basic authority for approvals of large sums may involve policy considerationes and should be subject to prior approval by the Board.[66]

Section 5(e) as enacted therefore requires Board approval in all cases involving amounts over the specified dollar limits, even if such awards involve no new policy considerations, as is the case when approval is sought for the continuation of NSF programs which the Board has already approved.

4. *National Science Foundation Policy on Applied Research*

The Daddario legislation explicitly authorized the Foundation to initiate and support applied research at academic and other nonprofit institutions, and also at profitmaking institutions when directed by the President in connection with national problems involving the public interest. The intent of the 1968 act to have NSF support applied as well as basic research was further clarified through deletion of the term "basic" in several references to NSF science activities that were present in the original enabling legislation of 1950. In particular, the term "basic" was dropped in the 1968 act's provision that "it shall be one of the objectives of the Foundation to strengthen research and education in the science. . . ." The Foundation has supported engineering research previous to the Daddario amendment, but under the original enabling legislation and in accordance with a National Science Board resolution adopted at its 77th meeting in May 1962, the Board considered engineering projects to be eligible for Foundation support only when they were basic scientific research projects and not routine engineering practice. During hearings that led to the enactment of P.L. 90–407, the Board expressed apprehension about the inclusion of applied research in NSF's legislative mandate since applied research might (1) lead to an emphasis on applied rather than basic research, (2) be used as a standard to gauge the utility of basic research, (3) be more properly supported by the Federal mission agencies, or (4) be more successfully and profitably carried on in private industry.[67] Mr. Daddario addressed the concerns of the Board by referring to the "fundamental position" of the House Committee on Science and Astronautics that NSF's new involvement in applied science activities should "not grow to the point where it could obscure and overcome the important work in basic research." [68] The Senate Labor and Public Welfare Committee expressed its intention that basic research should remain NSF's primary mission in the report accompanying P.L. 90–407:

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[66] Senate Report 90-1137, op. cit. ,pp. 17-18.

> It must be borne in mind that NSF was established to further basic, or fundamental, research, and it is not the intent of this legislation to change the Foundation's general character. NSF should and must retain its central mission of fostering basic research in science and engineering; the authority to engage in support of applied research should not be used at the expense of basic.[69]

The report went on to state that NSF's new applied science authority was intended to allow that agency to support applied research, primarily at academic institutions, which is inseparable, intertwined, or a logical extension of basic research already receiving NSF support, or which relates to major national problems.

5. *Other Policy Changes*

The 1968 act specifically authorized and directed NSF to give support to social science. Although authority for such support already existed by virtue of the general language of the enabling act of 1950, the new Act specifically added it to the list of enumerated disciplines.

Other new NSF activities authorized or directed by the 1968 Act include the support of the development and use of computer technologies in research and science education, science activities relating to international cooperation, the analysis and interpretation of data relating to national scientific and technical resources, and the determination of how much Federal money is received annually by educational institutions and nonprofit organizations in the United States.

6. *National Science Policy*

The Daddario amendment sought to clarify NSF's responsibilities for national science policy in light of the functions transferred to the Office of Science and Technology by Reorganization Plan No. 2 of 1962. The 1968 act did this by providing that "The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences."

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[67] Hearings on H.R. 13696 (1966), op. cit., p. 74, 88.
[68] Ibid., p. 74.
[69] Senate Report 90–1137, op. cit., p. 12.

This provision was intended to ensure that the National Science Board will have a strong advisory voice in national science policies promulgated by the President, particularly where national science resources are concerned. The Director was explicitly included in this advisory role in order to provide an avenue for recommendations from the Director's full-time executive perspective, apart from his perspective as a member of the Board.[70]

The Board's new function of preparing an annual report on noteworthy aspects of the health of science, discussed above, also bears on the Board's role in the development and recommendation of national science policies. This report was intended to provide the Board with a formal forum through which national science policy issues could be raised and through which appropriate policy options could be recommended.

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[70] Ibid., p. 16.

III. NSB RESPONSIBILITIES AND PROCEDURES

A. Responsibilities

This chapter provides a discussion of the relationship between policy and procedures in the work of the National Science Board. The chapter begins with an overview of the Board's organization, functions, workload, and secretariat. Succeeding sections of the chapter summarize critiques made during the 1970s of the National Science Board, by NSF staff, Board members, and others. The final section in the chapter summarizes proposals for revising the Board during the House Committee on Science and Technology's 1979 hearings on modifying the NSF organic act.

The National Science Foundation is the only Federal agency charged with responsibility for maintaining the overall health of fundamental science in the United States. The NSF enabling legislation established that the Foundation consists of the National Science Board and the Director. The Board was assigned policymaking responsibilities and the Director was given the responsibility for overall administration of the Foundation. Both of these functions are to be implemented within the overall policy framework enunciated by the Congress and the President.

The basic responsibility of the NSB is to establish policies to enable the Foundation to fulfill its statutory roles, which include:

> Initiate and support basic and applied scientific research and programs to strengthen scientific research potential and science education programs;
>
> Appraise the impact of research upon industrial development and upon the general welfare;
>
> Foster the interchange of scientific information among scientists in the United States and foreign countries; and
>
> Evaluate the status and needs of the various scientific disciplines.

The duties and responsibilities imposed upon the Board are further specified in the enabling legislation, as amended:

> The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences. (NSF Act, Sec. 3(d).)
>
> . . . The Board shall establish the policies of the Foundation within the framework of applicable policies as set forth by the President and the Congress. (NSF Act, Sec. 4(a).)
>
> The Director must consult with the Board in the formulation of programs in conformance with the policies of the Foundation. (NSF Act, Sec. 5(d).) In practice this means that the Board reviews and approves all new programs, as well as proposed awards in new programs until satisfied that the programs are sufficiently well-defined to justify delegation of approval authority to the Director. In addition, unusual or sensitive proposals are submitted to the Board for approval regardless of dollar amount

when a policy issue is involved, when the Director feels the need for advice from the Board, or when so requested by the Board.

The Director may not make any grant, contract, or other arrangement which involves a total commitment of $2 million or more or $500,000 or more in any one year without Board approval. (NSF Act, Sec. 5(e).)

The Board may delegate to the Director authority to make awards of lesser amounts. (NSF Act, Sec. 5(e).)

Each year the Board prepares an annual report for the Congress, due before March 31. "Such policy report shall deal essentially, though not necessarily exclusively, with policy issues or matters which affect the Foundation or with which the Board in its official role as the policymaking body of the Foundation is concerned." (NSF Act, Sec. 4(j).)

The Board, as it chooses, "reviews major reports on scientific and technological subjects (notably reports of the Committee on Science and Public Policy of the National Academy of Sciences) and offers recommendations for action or implementation by the Board, Foundation, or the Science Adviser to the President."[1]

The Board also exercises its policymaking role through such actions as participating in the formulation of the Foundation's annual budget requests to the President and the Congress, taking into account its own planning documents and those prepared by NSF staff members relating to determining priorities among fields of science, equitable distribution of funds, termination of outmoded programs, and the establishment of appropriate new programs.

Also the Chairman, Vice Chairman, and other Board members often testify before congressional committees on the topic of the Foundation's authorization and appropriations requests, as well as on pending legislation and scientific and educational subjects under consideration by the Congress. Prior to 1974, the Board's testimony was primarily philosophical in nature. Since then, while the burden of budget justification still falls upon the staff of the NSF, NSB members have begun to describe more details of their activity as the Foundation's governing Board and have reported to the Congress on their policy actions and the Foundation's responses.

In addition to making formal policy for the NSF (taking the form of formal statements, resolutions, letters to agency heads, and letters to the President's science advisor, the Director of OMB, and the President), the Board, from time to time, makes formal public pronouncements on scientific and educational issues which deal with "policy for science" in other agencies (that is, policies dealing with research support, conduct of research, and so on). At times the Board has submitted recommendations directly to the President or to his science advisor, and to the OMB, dealing with NSF research budgets. However, the Board's national science policy role seems limited primarily to insuring the strength of basic research and to creating a quality environment for the pursuit of academic science. The effectiveness of the Board's role as national science policy advisor exists only to the extent that the President's science advisor wishes it and other Federal agencies, which have specific scientific missions and larger research budgets, concur.

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[1] This last item is not included among the NSB's statutory responsibilities. A description of the requirement was taken from: National Science Board: Background Information. Nov. 1978, p. 9. (NSB-78-469.)

The Board also has assumed an oversight function, carried out by site visits, Programs Committee and full Board review of NSF programs, attendance at NSF advisory committee meetings, and guidance on establishment of audit and oversight procedures through the work of the Committee on Audit and Oversight.

B. NSB PROCEDURES

Most of the official Board work occurs during its meetings, usually held once a month, except during the summer. The statute governing the National Science Board specifies that the NSB shall meet annually in May and at other times when the Chairman or one-third of the members request so in writing. It also specifies that "a majority of members shall constitute a quorum." The Board has evolved a set of procedures which govern scheduling and operations of meetings. In addition, the Board is required to establish a schedule of meetings for the next calendar year at the preceding year's annual meeting.

1. Annual Meetings

The procedures specify that an annual meeting be held in May, at which the NSB committee structure is reviewed. During the May meeting, assignments of executive secretaries of NSB committees (typically NSF staff members) are reviewed. Since 1976, the Board has reviewed, on a biennial basis, the "program" delegations of authority to the Director at annual May meetings held in even numbered years.

2. Annual June Long-range Planning Meeting

Normally all Board meetings are held at NSF headquarters. But since 1970 the "summer" meeting of the Board typically has been held at an "NSF funded site," or at a Board member's home institution. Since 1972, these meetings have consisted of Board task force discussions on long-range issues of relevance to NSF, the Foundation's budget, and national science policy issues. Rules of procedure specify that proposals for grants and contracts, which the NSB normally approves during every Board meeting, are not considered at out-of-town meetings. (For details on these meetings, see chapter VI, on the Planning and Policy Committee.) A list of the sites for these meetings through 1980 appears in table 3.

TABLE 3.—*Locations of NSB meetings held away from National Science Foundation headquarters*

Fiscal year:	*Location*
1972	Summer Study Center, National Center for Atmospheric Research, Boulder, Col.
1973	Kitt Peak National Observatory, Arizona.
1974	University of Michigan Biological Station, Douglas Lake, Mich.
1975	Scripps Institute of Oceanography, San Diego, Calif.
1976	National Radio Astronomy Observatory, West Virginia.
1977	New Mexico Institute of Mining and Technology.
1978	National Center for Atmospheric Research, Boulder, Colo.
1979	Kitt Peak National Observatory, Arizona.
1980	Stanford University.

Source: NSB Board Books.

Starting in 1978, the Board established the practice of devoting one meeting (usually in November or February) to discuss long-range planning for budgetary purposes. Such meetings are usually the first in the NSB/NSF budget cycle, which begins about two years before the Foundation submits its budget request to the Congress.

3. Informal Contacts

According to the Board Executive Secretary, individual Board members interact with her office or the NSF Director almost daily—calling with questions or suggestions of topics to be considered as part of an agenda for the next Board meeting.[2] The most frequent type of exchange is between the Board Chairman or Vice Chairman and senior NSF officials. However, other Board members communicate directly with NSF staff, as well as with relevant Members of Congress or officers of scientific associations. In addition, Board members often spend time on Board affairs—reviewing proposed award files, drafting policy statements, or assisting with management and oversight of Board reports between official meetings.

C. AGENDA AND ACTIVITIES OF A TYPICAL BOARD MEETING

Usually each regular Board meeting is held on the third Thursday, Friday and preceding Wednesday of each month, and follows the same format. The Executive Committee and, in effect, the NSF Director, predetermines the agenda of each meeting. This occurs for three reasons. The Director is the chairman of the Executive Committee, which is responsible for setting the Board's agenda, he is the chief administrator of the agency, and it is mainly the Director's staff which formulates and prepares the background materials for discussion at Board meetings. These materials are sent to the Board members in preparation for the meeting, or are distributed during the meeting as a part of a "Board meeting book." Two "books" are prepared, one for the Board's open session and another for the closed session. Almost two-thirds of the time spent at each monthly meeting is devoted to NSB committee meetings, whose actions are subsequently reported to the full board. Each meeting also generally allocates considerable time to receiving information from the Director about NSF personnel and administrative activities, reports on NSF and NSB visits and meetings attendance, and program approvals. Details of a typical board meeting are set forth in appendix A.

D. LONG-RANGE BUDGET PLANNING MEETING

Starting in 1978, the Board began to devote one meeting, at first the November meeting, but now the February meeting, to a discussion of the Foundation's long-range budget planning exercise. This meeting is the first meeting of the NSB/NSF budget cycle. It is usually held almost two years before the budget is presented to the Congress. Details are given in chapter VII.

E. INCREASED BOARD WORKLOAD

The frequency and length of Board meetings have increased dramatically over time. In the fiscal year 1967 the Board met five times, in the fiscal year 1969 it met six times, and the next year it met seven times. Since the fiscal year 1971, the Board has held eight or nine meetings per year. During the fiscal year 1980, the Board was expected to meet ten times. Generally, when NSB committees meet, all day meetings start at 7:30 a.m. and go through dinner.

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[2] Ms. Anderson has kept an informal log of all such calls to her office, but reports that it is privileged. Without such information, a more quantitative picture of the between-meetings interactions with and between Board members and her office is not possible.

Dr. Norman Hackerman, a Board member since 1968 and Chairman for six years from 1974 to 1980, estimated that the Board's workload has doubled since 1967, with a commensurate doubling in workload for both Board members and staff and involving work both at the meetings and outside of actual meeting days. This increase is due to the Board's new oversight responsibilities added in the aftermath of the highly published dispute over NSF's budget MACOS, plus the fact that it ". . . has now changed from a Board that was philosophically oriented, to one that's now much more involved in the political process." Thus, according to Dr. Hackerman:

> In 1980 . . . [the Board] will meet 10 times. That is about 20 days, a relatively small number, but it represents a much greater contribution of Board Members' time because it also involves NSB committee meetings, extensive phone calls, a great deal of reading, and participation in a variety of NSF activities such as . . . [the] Advisory Council meeting. This doubling in activity resulted in part from the Board's conviction that it could best make policy by keeping in closer contact with the Foundation's activities. This wasn't met with great enthusiasm by the staff. I think it's fair to say that there was concern on the part of the staff that the Board was getting into operational activities. But it was based on a proposition that . . . you can't really make policy in a vacuum.[3]

Another measure of the increase in NSB workload over time is seen in the almost straight-line increase in the number of documents sent to NSB members by the NSB office staff between meetings, as ascertained from a search of the NSB document log. Full Board documents are sent to each Board member; in addition, documents for each separate committee are sent to Board committee members. In 1966 the full NSB document series sent to members totaled 244 items; this more than doubled to 492 by 1979. In addition, whereas in 1970, 30 committee-related items were sent to Board members, in 1979 a total of 377 items were sent. This growth of items mailed to Board members is shown for selected years in Table 4.

TABLE 4.—ITEMS MAILED TO NSB MEMBERS AS COLLATED FROM NSB DOCUMENT LOGS, SELECTED YEARS, 1966-79

	NSB documents	Executive Committee documents	Documents dealing with staff	Documents dealing with committees	Basic Research Committee	Budget Committee	Programs Committee
Fiscal year:							
1966	244						
1970	354	14					16
1975	389	28	27	40			
1979	492	31	33	101	16	15	17

ADDITIONAL ITEMS IN 1979

Planning and Policy Committee	Annual Report No. 13	Annual Report No. 12	Annual Report No. 11	Science and Society Subcommittee	International Science Subcommittee
33	14	95	12	3	7

Source: Compiled from NSB-supplied material.

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[3] Comments of Dr. Norman Hackerman at the meeting of NSF Advisory Council, May 1980, p. 2.

The Board's budget for compensation and travel also may be a good indicator of its workload over time. Trends show almost a tripling in expenditures for Board members' compensation and travel since 1970, from a total of $100,732 to $285,000, estimated in 1981. (Data are not corrected for inflation.) See table 5.

TABLE 5.—NATIONAL SCIENCE BOARD COMPENSATION AND TRAVEL, FISCAL YEARS 1968–81

	Compensation	Travel
Fiscal year:		
1968	[1] $50,000	$37,677
1969	[1] 50,000	[1] 40,000
1970	55,967	44,765
1971	67,818	63,009
1972	[1] 90,000	[1] 75,000
1973	101,157	93,896
1974	95,402	95,694
1975	107,500	94,678
1976	101,062	96,565
1977	97,129	119,912
1978	173,117	104,904
1979	117,715	62,884
1980	150,000	135,000
1981	150,000	135,000

[1] Estimated. Financial records have been retired to the Records Center and data for these years are missing from Budget Office files.

Source: NSF-supplied information

F. RULES APPLICABLE TO MEMBERS OF THE NATIONAL SCIENCE BOARD

Over the years, the Board has adopted resolutions and operating procedures to govern the behavior of its members with respect especially to: (1) possible conflicts of interest arising from the need to act on proposals from institutions with which members may be affiliated, and (2) the role of NSB members as public officials. Summarized below are the major operational rules established by the Board.[4] The texts of the policy statements or resolutions which are summarized may be found in appendix B.

Independence of Board Members Term From Political Cycle.—Board members serve six-year terms with a definite expiration date. Hence, members are not required to submit their resignations when an Administration changes.

Board Members Become Consultants Until Successors Are Appointed.—The Board has agreed that members whose terms have expired should be invited to continue to serve as consultant, without a vote, until their succesors have been duly appointed.[5] In practice, members serve about one additional year, and sometimes beyond the beginning of the terms of their successors. In addition, they often subsequently serve as consultants to the Board on special issues even after expiration of this period.

Nominees Serve as Consultants Until Confirmed.—Board nominees, following submission of their names to the Senate for confirmation, are appointed as consultants to the Board and are invited to participate, without a vote, in Board activities.

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[4] The items in this list are based on a discussion in: Memorandum to Members and Consultants of the National Science Board. Subject: Compendium of NSB Rules. Nov. 3, 1978, pp. 5–6. (NSB–78–455.)

[5] 200: 14. NSB/Res–78–83.

The Board sought changes in this rule. During the January 1980 Executive Committee meeting, the General Counsel reported that NSF had submitted two proposed technical changes via OMB to the Congress. They were:

(a) That Members continue in office, with full voting privileges, until their successors have been qualified; and

(b) That the election of the Board Chairman and Vice Chairman be changed from the even- to the odd-numbered years to provide an opportunity for new Members to participate in the election.

Following discussion, the Committee agreed that the first change should be pursued, but not the second. But the Congress did not enact even this clause.[6]

Foreign Travel Regulations.—It is also desirable that Board members report major travel plans to the Board office, especially foreign travel. The Department of State is notified when Board members, who are presidential appointees, travel abroad. Board members should also promptly inform the Board office of changes in titles or addresses.

Congressional Testimony.[7]—The chairman, Vice Chairman, and other Board members appear before congressional committees in support of the Foundation's annual authorization and appropriations requests. Written testimony must be cleared with OMB in advance of delivery. If asked about a Board position, a Board member should report his/her understanding of the formal posture of the Board as accurately as possible. If asked for a personal view, a Board member may state it, making clear that she/he is speaking as an individual.[8]

Avoiding Conflicts of Interest

A number of procedures have been instituted to insure that Board members avoid conflicts of interest.[9]

NSB Members Shall Not Serve as Mail or Peer Reviewers.—Board members should not serve as mail reviewers or otherwise review proposals pending before the Foundation.

Abstention From Voting on Proposals From Institutions With Which Members are Affiliated.—Board members should absent themselves from discussions of proposals from their institutions or family members and should abstain from voting on proposals from an institution or organization with which they or their family members have a participatory role.

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[6] EC : AR : 2, regarding Executive Committee meeting, 80–1, Jan. 16, 1980.

[7] See footnote 9 below.

[8] Based in particular on "NSB Congressional Statements," Discussion at Executive Session on NSB meeting 154 (154 : 12) ; and NSB Members as Congressional Witnesses. Discussion of Report of the Programs Committee at Executive Session of NSB meeting 162 (ES : 162 : 5).

[9] These provisions are based on the following resolutions or policy statements, which are included in full in appendix B :

"Participation of National Science Board Members in NSF Projects," Resolution adopted by the NSB at its 55th meeting on Spt. 16–17, 1958, as amended at its 67th meeting on Sept. 8–9, 1960, and at its 95th meeting on June 18–19, 1964 (NSF–64–133, Revised.)

"Matters Relating to the Holding and Conduct of the Office of Members of the National Science Board, Including Conflicts-of-Interest and Political Activities," Memorandum to Members of the NSB, Mar. 20, 1968, 13 p. (NSB–68–77.)

Statement Regarding Conflicts of Interest. Adopted by the NSB at the Executive Session (ES : 148 : 28.)

Statement Regarding Proposal Evaluation by Board Members. Adopted at ES : 156 : 16.

Resolution Regarding Conflicts of Interest and National Science Board Member Affiliations, Supplemental Resolution to NSB–68–77, Adopted, ES 158 : 3, 16–17.

Use of NSB Members as Proposal Reviewers. Staff Memorandum from Office of the Director, June 7, 1973 (O/D 73–15.)

Conflicts of Interest and NSB Members Affiliations. Memorandum to Members of the NSB, Sept. 11, 1973. p. 3. (NSB 73–226.)

Compilation of NSB Resolutions, 1968–1976, prepared by Office of the General Counsel, NSF.

NSB Members May Participate in an NSF-funded Research Project, But May Not Be Principal Investigators.—Board members may take part in the work of projects supported by the NSF, but they may not serve as principal investigators on the grant, nor may any part of their salaries be charged to such an award. Some members apparently favored supporting a change in the regulation to permit NSB members to become principal investigators on NSF grants. In March 1977, the Ad Hoc Committee on NSB Research Support recommended that this be allowed if appropriate safeguards were instituted (such as signing a disclaimer statement vouchsafing any personal financial gain, establishing a Board oversight committee, and so on.) The motion was rejected, however.[10]

G. COMPENSATION

The Board also has adopted resolutions and procedures regarding compensation. The original NSF Act placed a $25 per day limit on compensation for Board members. In 1959, this was raised to $50 per day; it was raised to $100 in 1968, which was comparable to the GS–18 level.[11] In 1977, pursuant to a request from the NSB, P.L. 95–99, the NSF Authorization Act, raised the level of Board members' compensation. It allowed the Chairman to fix a daily rate, not to exceed the rate for the GS–18 level. Travel expenses were also authorized.[12] The Executive Committee reviews the rate of compensation for NSB members on an annual basis at each December meeting. For 1979, this rate was fixed at $150 per day. The rate was raised to $192.75 for 1980 for NSB members and consultants.

During 1978, NSB members sought to be exempted from regulations governing conflict of interest in connection with requesting support services while performing Board or Foundation functions at their home institutions.[13] Subsequently the conflict of interest regulations were waived upon Board request, enabling Board members to apply to the Chairman for financial assistance from NSF to handle Board business at their home institutions.[14]

H. EXEMPTION OF MEMBERS FROM PUBLIC DISCLOSURE PROVISIONS OF THE ETHICS IN GOVERNMENT ACT

In 1978 and 1979 several Board candidates and nominees withdrew their names from consideration because they objected to public disclosure of their personal finances as required by the Ethics in Government Act of 1978, P.L. 95–521. The Board Chairman wrote a letter to the President requesting relaxation of the Act for NSB members, who serve as part-time policy advisers, on the grounds that the Act served to discourage service by noted scientists and therefore was detrimental to the course of science in the Nation. The White House established a group to study this issue.[15]

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[10] For additional details, see Research by NSB Members (Report of Ad Hoc Committee on NSB Research Support, 188 : 27–30). (NSB 77–113.)

[11] CS : 188 : 6.

[12] 192 : 4–5.

[13] Proposed Regulations Exempting Board Members from Certain Financial Conflicts of Interests, NSB/Res–78–120 (202 : 29), included in Appendix B.

[14] 205 : 13.

Later P.L. 96–19, signed on June 13, 1979, amended P.L. 95–521, so that presidential appointees, who are not expected to work in excess of 60 days in a calendar year, will not have to file initial, annual, or termination financial disclosure reports. As a result, while Board nominees will still be required to submit confidential personal and financial reports to the White House and the Congress, these documents will not be made available to the public.[16] The adoption of this exception removed the obstacle for those nominees who were concerned about disclosure of personal information.

I. EVOLUTION OF NSB COMMITTEE STRUCTURE

In creating the NSB, the Congress recognized that the Board would have to create committees to fulfill its complex responsibilities. The NSF Act created an Executive Committee of the Board to "exercise such powers and functions as may be delegated to it by the Board." (Sec. 7.) The legislation also authorized the Board to "establish such special commissions as it may from time to time deem necessary for the purposes of this Act." (Sec. 4 (h)), and to appoint committees "with such survey and advisory functions as the Board deems appropriate to assist it in "exercising its powers and functions. . . .' " (Sec. 4 (i).)

1. Structure From 1968 to 1970

The NSB committee structure has evolved considerably since the enabling legislation was revised in 1968. The basic trend that is evidenced is one of flexibility—an ebb and flow of committees to serve a particular need or problem area and the preferences of Board chairmen and members.

Shortly after passage of the legislation amending the NSF's enabling Act, an Ad Hoc Committee on Board Operations reported to the NSB, on August 29, 1968, recommending a preferred committee structure. The report suggested that the Executive Committee be given considerable authority:

Responsibility for budget and fiscal matters,

Responsibility for legislative liaison,

Service as the Board's agenda-setting committee, and

Responsibility for coordinating the activities of the NSB's three policy committees.

The three policy committees which were proposed and which were subsequently established were:

Programs Committee, responsible for reviewing the substance of on-going programs and new programs areas,

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[15] CS :203 :12–13. CS :203 :6. The letter was dated Jan. 22, 1979. CS :204 :2. As an example, the annual report of the 1979 Executive Committee meeting, No. 1, reported that:

> Dr. Lewis M. Branscomb has asked that his name, at least for the time being, not be submitted to the Senate for consideration as a nominee to the NSB. This decision was made in light of recently available information regarding the requirements of the Ethics in Government Act of 1978 for public disclosure of personal, financial, and employment data. He stated in a letter of January 10 to the Board Chairman his regret at having to take this action because he felt it was an honor and a privilege to be appointed to the Board. (EC : 79–1 : 3.)

[16] EC : 79–9 : 8.

Institutional Committee, responsible for policy issues relating to the administration of funds and awards for institutional programs, and

Long-range Planning Committee, responsible for national and NSF "science policy" related issues.

The Board at that time also had two proposal review committees to prepare recommendations to the Board regarding proposed actions which needed Board approval. The two committees were the Research Review Committee (for research projects, national centers, and sea grants), and the Education Review Committee. The Board also had several ad hoc committees.[17]

2. Changes Made in 1970

Three major types of changes have been made in the NSB committee structure since 1968: (1) the creation of new committees, as warranted, to assume some of the original functions given to the Executive Committee, (2) streamlining of the committee structure following a proliferation of ad hoc subcommittees created in reaction to a crisis or to serve a particular function, and (3) clarification of the number and functions of committees with the establishment of more task committees, of more permanent duration. Prior to these changes the Board had six ad hoc committees. Some of the standing committees had subcommittees.

In 1974, the Board started the practice of eliminating some ad hoc and subcommittees and maintaining four kinds of committees:

Statutory.—Executive Committee (provided for in the NSF Act to exercise such powers and functions as may be delegated to it by the Board).

Standing.—Planning and Policy Committee (concerns itself with general policies and budgets, particularly the balance among NSF programs) and Programs Committee (examines new and ongoing programs and those individual projects which require Board approvals).

Task.—Established to accomplish a specific mission of some duration; examples are Committee on Budget, Committee on Eighth NSB Report, Committee on Minorities and Women in Science, etc.

Ad Hoc.—Established to carry out specific duties of a short-range nature; examples are the Ad Hoc Nominating Committee for Board Officers, Ad Hoc Committee on Peer Review Survey, etc.[18]

The new Chairman also reorganized the Budget Committee as a separate task committee, whose membership did not overlap with that of the Executive Committee.

3. Annual Review of Board Committee Charges Instituted in 1976

An informal review of the Board's committee structure made by a summer intern at the request of Chairman Hackerman in 1976 criticized the proliferation of committees and the overlap in their charges—an overlap which the author of the review said occurred because the Board had not examined committee functions seriously since 1971 and because committee chairmen's personalities often determined the functions of the groups they chaired. This problem was so serious, the report continued, that policy recommendations often were inconsistent over time or with respect to the same policy at a given time. The Board's flexibility in creating committees to serve particular needs would not be compromised, the report continued, if the committee charges were made explicit and reviewed annually and if the committee structure were further simplified.[19]

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[17] Report of Ad Hoc Commmittee on Board Operations, Aug. 29, 1968, p. 6. (NSB–68–249.)

[18] U.S. Congress. House. Committee on Science and Technology. Fiscal Year 1977 National Science Foundation Authorization Hearings. 94thCongress, first session. Washington. U.S. Govt. Off., 1976, p. 40.

Following this report, the Chairman instituted a policy requiring the Board to review the charters of the committees every year at the annual meeting and always after new Board members assumed their duties. Chairman Hackerman also instituted a policy of preparing a memorandum for Board members, following each Board meeting, which listed the tasks for Board committees which arose from discussions at the previous Board meeting.[20]

4. *Current Committee Rules of Procedure and Committee Structure*

The rules of procedure currently in effect specify the following relationships:

> The NSB Chairman assigns members to committees other than the Executive Committee, which is by election,
>
> Committee chairmen are ex officio members of any subcommittees of the parent committee,
>
> The NSB Chairman and Vice Chairman are ex officio members of all committees,
>
> The Chairmen of the standing committees are invited to attend Executive Committee meetings and receive Executive Committee documents.

When he became Chairman of the Board, Dr. Branscomb also took steps to streamline Board organization and procedures. He proposed that the NSB Vice Chairman serve as liaison between the Executive Committee and all other Board committees. The Board agreed to this change.[21] The Chairman also consolidated committees by eliminating some ad hoc committee.[22] See Appendix D.

He also proposed, and the Board agreed, that the chairmen of the statutory, standing, task, and ad hoc committees be responsible for scheduling meetings of all their subcommittees or task committees, particularly those which include Board members with other parent committee assignments. This arrangement was undertaken in order to provide more flexibility and less conflict between committee meeting times.[23]

Reflecting an apparent desire to widen the Board's mission to consider more national science policy issues, Dr. Branscomb assigned several new national science policy oriented issues to the Planning and Policy Committee, whose chairman created two new subcommittees of the Planning and Policy Committee to deal with them: a Subcommittee on Coordination and Management of Applied Research, and an NSB and National Science and Technology Issues Subcommittee. He also created a PPC Subcommittee on Science and Education.

Dr. Branscomb also made another change intended to free the Board of some routine management responsibilities in order to allow more time for Board consideration of broader policy issues:

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[19] Memorandum to the Chairman, National Science Board, May 18, 1976.
[20] NBS 76–340.
[21] 217 : 4.
[22] 217 : 4.
[23] 218 : 3.

In an effort to provide better utilization of the time available for discussion of priority items at Board meetings the Chairman has proposed that members report in writing on meetings, site visits, and other events which they attend on behalf of the Board, in discharge of their oversight responsibilities, rather than reporting orally at Board meetings. Reports should be submitted to the Board Chairman; they in turn will be provided to the Board.[24]

The current committee structure is:

NATIONAL SCIENCE BOARD COMMITTEE STRUCTURE AND MEMBERSHIP, JANUARY 1981

The National Science Foundation Act assigns policymaking functions to the National Science Board and the administration of the Foundation to the Director. The Board's policymaking responsibilities are met initially through the work of its committees.

Except for the Executive Committee, which is a statutory committee, the National Science Board and its Chairman establish the committees of the Board and make appointments to them. At each annual meeting the Board reviews the committee structure and the continuation of the task and ad hoc committees.

Board committees fall into four categories: statutory, standing, task, and ad hoc. The functions of the committees consist of a series of initial charges and such variations as are deemed desirable and useful once the committees are in operation.

The functions and chairmanship of the current Board committees are given below:

A. Statutory Committee

Section 7(a) of the National Science Foundation Act, as amended, states that: "There shall be an Executive Committee of the Board (referred to in this Act as the 'Executive Committee'), which shall be composed of five members and shall exercise such powers and functions as may be delegated to it by the Board. Four of the members shall be elected as provided in subsection (b), and the Director ex officio shall be the fifth member and the chairman of the Executive Committee."

The *Executive Committee* has the following responsibilities:

Fulfills statutory functions: (1) exercises such powers and functions as may be delegated to it by the Board, and (2) renders an annual report to the Board, and such other reports as it may deem necessary, summarizing its activities and making such recommendations as it may deem appropriate. Minority views and recommendations, if any, of members of the Executive Committee are included in such reports.

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[24] 219: 3.

Acts on behalf of the Board between meetings on (1) grants, contracts, or other arrangements; and (2) other instances where immediate decision is required. (All such actions are reported to the Board at its next meeting.)

Coordinates and offers guidance on activities of the Board and its committees.

Serves as agenda committee for the Board.

Identifies subjects to be considered by task and ad hoc committees.

Considers and approves affiliations of the Director, Deputy Director, and Assistant Directors.

B. Standing Committees

The standing committees of the Board are continuing committees with definite responsibilities to peform assigned tasks and to present recommendations to the Board. All Members who are not on the Executive Committee are assigned to either the Planning and Policy Committee or the Programs Committee.

1. The Audit and Oversight Committee, chaired by Dr. Lloyd M. Cooke, reviews the requirements for continued functioning of the Action Review Boards and the effectiveness of other oversight mechanisms.

2. The Budget Committee, chaired by Dr. Marian E. Koshland

Provides a focal point for Board participation in budgetary matters, including program priorities.

Provides advice to the Board on NSF authorization and appropriation issues.

Reexamines priority considerations, based on results of the long-range planning meetings, to integrate (a) immediate priorities into summer and fall budget preparation, and (b) deferred program priorities into fall preparation of long-range planning estimates.

Meets with Planning and Policy Committee to review results of Board discussion of and actions/guidelines on the planning environment review document for long-range planning meetings.

Helps serve as spokesman for the Board on NSF budgetary matters with the Congress and the Office of Management and Budget.

3. The Planning and Policy Committee, chaired by Dr. Walter E. Massey:

Considers policy issues and prepares draft documents including "white papers" on principal planning and policy issues affecting research and science education for subsequent Board consideration.

Identifies and recommends actions for the Board with regard to policies and practices affecting research and science education in the Nation with particular attention to NSF.

Develops and coordinates the long-range planning meetings of the Board and all associated documentation through interaction with NSF staff.

Identifies national science policy issues and national needs and considers the proper roles of the Federal Government in general and NSF in particular.

Meets with the Budget Committee to coordinate planning, policy, and budget processes.

The Planning and Policy Committee has four active subcommittees:

Coordination and Management of Applied Research, chaired by Dr. Joseph M. Pettit.

NSB and National Science and Technology Issues, chaired by Dr. Raymond L. Bisplinghoff.

Science Education, chaired by Dr. John R. Hogness.

Science and Society, chaired by Dr. Eugene H. Cota-Robles.

4. The Programs Committee, chaired by Dr. Ernestine Friedl:

Reviews proposed programs and makes recommendations to the Board.

Reviews all proposals for support containing new policy issues or over certain dollar amounts prior to presentation to the Board with Committee recommendations.

Monitors existing programs and activities.

Maintains oversight on long-term commitments of the Foundation.

Schedules formal and informal reviews of programs, especially for input to discussion of the planning environment review document at the long-range planning meetings.

C. Task Committees

The task committees of the Board are assigned specified tasks which are sometimes of a short-term nature. These committees are discharged upon completion of these assigned tasks.

1. The Committee on Minorities and Women in Science, chaired by Dr. Eugene H. Cota-Robles, considers education and research programs to increase the flow into science of (a) ethnic minorities, (b) women, (c) the disadvantaged, and (d) the physically handicapped.

2. The Committee on Twelfth NSB Report, chaired by Dr. John R. Hogness, provides oversight on preparation of the report to the President and the Congress. The Report deals with the rich variety of mutual interplay between scientific research, the development of technologies, and social utility.

3. The Committee on Thirteenth NSB Report, chaired by Dr. Joseph M. Pettit, provides oversight on preparation of Science Indicators—1980, due March 1981.

4. The Committee on Fourteenth NSB Report, chaired by Mr. Herbert D. Doan, provides oversight on preparation of the report to the President and the Congress, due March 1982. This Report addresses the practices, problems, and potentials of university-industry research relationships in the United States.

D. Ad Hoc Committees

Ad Hoc Committees of the Board have specific tasks generally of short duration.

1. Ad Hoc Committee on Deep Sea and Ocean Margin Drilling Programs, chaired by Dr. Raymond L. Bisplinghoff, monitors the developments regarding the future drilling programs and advises the Board of the alternatives that are being considered, the management of the programs, the costs, and how those costs might be shared among agencies of the U.S. Government, industry, foreign countries, or other groups.

2 Ad Hoc Committee on NSB and NSF Staff Nominees, chaired by Dr. William F. Hueg. Jr., offers recommendations to the Board on candidates for the vacancy on the Board and the position of Assistant Director for Science Education.

J. INFREQUENT USE OF STATUTORY PROVISIONS ENABLING NSB TO CREATE COMMISSIONS

Although the NSF Act includes provisions for the Board to establish special commissions, it has made little use of them. The act states that "The Board is authorized to establish such special commissions as it may from time to time deem necessary for the purposes of this act." It further states that each commission shall consist of 11 persons appointed by the Board: six eminent scientists and five nonscientists. The Board has utilized the special commission authority to consider three subjects: synthetic rubber, weather modification, and social sciences. The resulting reports were:

Knowledge into Action: Improving the Nation's Use of the Social Sciences, 1969;

Weather and Climate Modification, 1966; and

Future Role of the Federal Government with Respect to Research in Synthetic Rubber, 1955.

The Board authorized the establishment of another commission—on applied science—in 1967. However the commission was never appointed because the Board decided subsequently that the report, *Applied Science and Technological Progress—A Report to the Committee on Science and Astronautics*, by the National Academy of Sciences, would serve the purpose of the planned commission.[25] In 1976 the Chairman reminded the Board of the possibility of using commissions to study current major issues before the Board, such as Federal support of basic research in industry, the role of NSF in international science, and various long-range planning issues discussed at the annual June meetings.[26] However, no commissions have been named since 1969.

In 1980, new NSB Chairman Lewis Branscomb requested the General Counsel to prepare a brief on the use of commissions. The Counsel's memorandum noted that, if a special commission were composed wholly of Board members, the commission would be treated like any other Board committee. However, "If any of the members of the Special Commission are from the private sector, the Commission is then considered a Federal Agency Committee and subject to the following:

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[25] Memorandum to Chairman: National Science Board, Subject: Special Commissions of the Board, Nov. 6, 1980.

[26] ES 180: 5.

a. The Commission must have a charter.

b. The charter must be approved by OMB.

c. The intent to establish the Commission must be published in the *Federal Register*.

d. The Commission may not convene for 30 days after announcement in the *Federal Register*, and

e. Thereinafter, all procedures followed in the regular meetings of the Board, must be observed for the meetings of the Commission.[27]

K. RATES OF ATTENDANCE AT BOARD MEETINGS

Board attendance rates appear to be less than wholly adequate. As Appendix C shows, from 1969 to 1980, in about one-third of all meetings held each year, only two-thirds of the members were in attendance. A quorum of the full, statutorily authorized NSB (24 members) was not present four times, twice in 1976, once in 1979, and once in 1980. Most of this absenteeism is due to lack of timely confirmation of new Board members, who in many cases were present as non-voting consultants in the meetings, according to the data just noted. However, an accounting shows that several Board members seem to have been repeated absentees.

L. STAFF SUPPORT FOR THE NATIONAL SCIENCE BOARD

1. *Executive Secretary*

The NSB has had two executive secretaries since its inception. The current executive secretary, Vernice Anderson, has served in that capacity for over 25 years (since 1953, although she was not officially named executive secretary until 1971). She and her assistants have played a vital role in the evolution of the Board. Testimonials and letters honoring her services from Board members indicate that she has assisted the Board by:

Aiding in determining priorities for Board action,

Providing comprehensive and confidential communications between the NSB officials and the NSF Director. In fact, former Director Atkinson commented that while he probably spoke with NSB Chairman Hackerman about once a week, except during intensive budget preparation when they consulted more often, he communicated daily with Ms. Anderson in an effort to help her keep NSB informed of relevant activities.[28]

Familiarizing members and chairmen with NSF policies and procedures, as well as with knowledge of political power alinements within NSF,

Developing administrative and library practices which permitted maintenance of the continuity and institutional memory needed for a part-time Board, and

2. *NSB Support Staff*

The NSF Act Amendments passed in 1968 gave the Board authority to appoint "... a staff consisting of not more than five professional staff members and such clerical staff members as may be necessary." Staff were to be paid at a level not exceeding GS-15.[29] Two motives have been attributed to this provision. One was that the Board sought this authority itself.[30] Another was that a congressional oversight committee (the House Committee on Science and Technology) decided that the Board needed this authority in order to do the detailed oversight and planning analysis required by its responsibilities for new programs approval and review that the legislation thrust upon it. However, the Board's history shows that, with the exception of a short period of time, from November 1976 to April 1978, the Board has chosen not to utilize this staff support authority to the fullest.

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[27] Memorandum to the Board Chairman: Subject: Requirements of the Federal Advisory Committee Act, No. 13, 1980.

[28] Interview.

On April 21, 1975, the Director issued a staff memorandum that established a coordinating committee for staff support of Board activities and assigned responsibility for coordination of NSF professional staff support for the Board to the Office of Planning and Resources Management.[31] However, in 1975, following a Planning and Policy Committee examination of the overall NSB objectives, the Board relationships to NSF activities and functions, and the NSB organizational structure and practice, the committee recommended that, to the extent possible, the Board's activities should be moved "away from narrower management issues" and toward policy concerns and increased effectiveness of its oversight responsibilities. To this end, it recommended that the Board delegate approval responsibilitiy to the extent possible and that it set up a PPC Subcommittee on Mechanisms for Improved Oversight and External Communications.

This PPC Subcommittee eventually recommended that the Board improve its procedures by implementing its authority to hire professional staff to assist with its work. During the March 1976 meeting, the Board Chairman endorsed this and proposed that the Board consider establishment of a small rotational staff for specific periods of time (one to three years) from NSF and external sources, under the supervision of the Office of the Director, but reporting to the Board. The staff would be provided with appropriate secretarial assistance and space adjacent to the Board offices and would be identified as "NSB scientific staff." [32]

Also during 1976, the Congress passed the NSF authorization bill for fiscal year 1977, which raised the civil service grade level of NSB support staff from GS-15 to GS-18.[33] The NSF Act was also amended to require that the Director's appointments of such staff shall be made only after consultation with the Chairman of the Board. The rationale for these changes was the Committee's concern that:

> this staffing authority has not been used, particularly in view of the increased responsibilities of the Board as the policy-making arm of the Foundation. The $800 million budget for which it is responsible requires that it be supported by the best scientific and technical assistance obtainable within the Fed-

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[29] P.L. 90-407, Sec. 4(g).
[30] Interview with a staff member of the House Committee on Science and Technology, 1980.
[31] NSF Staff memo O/D 75-23, 172 : 6.
[32] ES : 180 : 25, ES : 182 : 10, ES : 184 : 3.
[33] Section 9 of P.L. 94-471, Oct. 11, 1976.

> eral Government. The scaling upward of the grade level at which staff can be compensated is a partial attempt to address this very real need, and is expected by the Committee to result in the early appointment of staff members to serve the Board.[34]

A competitive selection was held, and from among 30 applicants three were selected. All had been members of NSF's staff. The new NSB staff functioned primarily by serving as full-time executive secretaries for the committees that the Board had established to manage the preparation of its annual reports. They also served for a time as executive secretaries of other Board committees.[35]

3. Cutbacks of NSB Support Services, Role of the Office of Planning and Resources Management

Over the next year or two, the three staff members were reassigned back into the NSF, or left the Foundation. The Board concluded that the arrangement of having "NSB scientific staff" was unsatisfactory, and that instead of hiring staff to serve it directly, it should utilize NSF staff members to serve as executive secretaries of Board committees.[36]

The arguments made against having a full-time scientific staff support are: a deliberate separation of NSB and NSF staff causes communications gaps since it creates a "we" versus "they" attitude which prevents the Board from obtaining all the information and insight into NSF operations that would be afforded by using NSF staff part-time; and NSB staff may be "shortchanged" if they stay away from their disciplinary responsibilities too long and they may encounter difficulties when they try to reassume responsibility for managing the Foundation's disciplinary support programs.

During the last few years, the Board had only two staff members who filled the category of NSB professional staff assistants: the executive secretary and the special assistant to NSB Chairman Hackerman, both of whom also served as executive secretaries of committees dealing specifically with Board business, such as nominating NSB officers. It appears that new NSB Chairman Branscomb does not intend to name a special assistant in the NSB office, but instead will utilize staff assistance from the office of his employer. Chairman Hackerman's staff assistant performed such functions as helping to write the Chairman's speeches and serving as executive secretary of the NSB Planning and Policy Committee.

Currently the executive secretaries of most NSB committees are NSF staff members, mainly special assistants to the Director or members of the Office of Planning and Resources Management. See table 6 and appendix D. Table 6 also indicates that NSF staff serve in other capacities, assisting the Board with background materials for the Board's Budget Committee activities and with the Planning and Policy Committee's long-range planning activities that is, the *Status of Science* document.

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[34] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Authorization Act, 1977. Report to Accompany S. 3202. Washington, U.S. Govt. Print. Off., p. 41. (94th Congress 2nd Session. Senate Report No. 94–888.)

[35] 186 : 22. NSB Professional Staff Established. NSF Bulletin, v. 4, March 1977 : 1.

[36] According to an NSF staff member, Dr. Eugene Sunderlin served as an NSB scientific staff member from November 1976 to April 1978, Dr. J. Zwolenik from November 1976 to May 1979, and Dr. Robert Wright, from November 1976 to November 1977.

TABLE 6.—OPRM MAN-HOURS IN SUPPORT OF THE NATIONAL SCIENCE BOARD, JULY 1, 1979 TO JUNE 30, 1980

	Executive secretarial support				Status of Science support			Policy analyses, budgets and reports			
	Hours	Average grade	Persons	Percent of their time	Hours	Persons	Percent of their time	Hours	Average grade	Persons	Percent of their time
OFFICE OF PLANNING AND RESOURCES MANAGEMENT											
Director's office:											
Professional	26	SES [1]	2	*0.6				150	SES	2	3.6
Clerical	10	GS–8						50	GS–8		
DIVISION OF STRATEGIC PLANNING AND ANALYSIS											
Director's office:											
Professional	12	SES	1	.6	32	1	1.5	60	SES	1	2.9
Clerical	3	8						20	8		
Planning and policy analysis office:											
Professional	[2] 1,734	13.5	5	16.7	20	1	9.6	285	13	3	4.6
Clerical	[3] 119	3						40	3		
Program review office:											
Professional	[4] 257				118	5	1.1	30	15	1	1.4
Clerical					257			3	2		
DIVISION OF BUDGET AND PROGRAM ANALYSIS											
Director's office:											
Professional								40	15.3	2	1.0
Clerical								6	8		
Budget office:											
Professional								20	14	1	1.0
Clerical								2	6		
Programing office:											
Professional	625	14	1	30.0				10	14.5	5	1.0
Clerical								4	8		

[1] SES—Senior executive service—Upgraded.
[2] Includes 1,120 hr of 1 staff person's time. (53.8 percent of 1 person's time.)
[3] Includes 10 clerical hours in support of the programing office.
[4] For program raviews, grade unclassified.
*Each.

Source: Data provided by NSF

Interviews with several NSF staff members who have served as executive secretaries indicate that they spend far more time than is portrayed in Table 6 when serving as executive secretaries and that their services encompass such responsibilities as suggesting issues for Board study, preparing all necessary background information, and serving as liaison with scientific and community groups and with contractors. Some staff members estimate that such service consumes 100 percent of their time. Indeed many staff members have complained that Board-related responsibilities are burdensome and a waste of time and paper. Others disagree and say that the research and analysis would have been required to assist the Director anyway.

It appears that this situation warrants further attention, especially in view of the fact that the Board has not utilized its allocated five-person staff capability to the fullest. It may be necessary to assess the need to modify the statutory language since the Board has adopted the alternative arrangements of using NSF staff members and hiring staff at their home institutions.[37]

The Director established the Office of Planning and Resources Management (OPRM), originally to provide himself and the Board with resources and staff to prepare information on matters of policy, budget, and management. The budget allocation for this activity has been about $3 million during the last few years.

M. THE BOARD'S ROLE IN AWARDING HONORARY PRIZES

The Board also plays a role in awarding two scientific prizes, the Waterman and the Bush awards.

The Alan T. Waterman Award for a promising young scientist, was authorized by the Congress in 1975 to mark the 25th anniversary of the NSF. The Board's role is limited to advising the Director regarding the selection of members of the award committee and to authorizing guidelines for implementation of the award. The Waterman award was named in honor of the NSF's first Director. It is given annually to an outstanding young researcher working in any field of science, mathematics, or engineering. In addition to a medal, each recipient receives up to $50,000 per year for three years for scientific research at an institution of his or her choice. Originally the award was given to recipients 35 years of age or younger. In 1980, at the request of the award committee, the Board revised the eligibility guidelines to require that the recipient, if older than 25, be not more than five years beyond receipt of the Ph. D. degree.[38] Ex officio members of the committee in 1980 were: Dr. Norman Hackerman as Chairman of the NSB, Dr. Richard Atkinson, Director of the NSF, Dr. Philip Handler, President of the National Academy of Sciences, and Dr. Courtland Perkins, President of the National Academy of Engineering.

The Vannevar Bush award was established by the NSB, without specific legislative authority, on February 21, 1980, but only after considerable disagreement,[39] to honor a senior statesman of science and technology who has made outstanding contributions to those fields through public service to the Nation. The award is given only from time to time when warranted, and is an honorary award. The first award was given on May 15, 1980, at the Board's annual dinner meeting to James R. Killian, Jr., an educator and the country's first full-time presidential science advisor. The award is named in honor to Dr. Vannevar Bush, who recommended in the 1945 report, *Science, The Endless Frontier*, that a foundation be established by the Congress to serve as a focal point for the Federal Government's support and encouragement of basic research and education in the sciences and for the development of a national science policy.

N. CRITIQUES OF NSB/NSF OPERATIONS

On several occasions since 1968 the Board has reviewed its activities in relation to the broader context of science policymaking. In addition, the Board has received or contributed to reports of various committees reviewing the Foundation as a whole. Most of these activities have been externally motivated. These reports and their recommendations are summarized below.

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[37] Proposed Regulations Exempting Board Members From Certain Financial Conflicts of Interest. NSB/Res 79–27 (205: 13).

[38] 215: 13.

[39] 212: 20–21, NSB/Res 80–10, 215: 6–7.

1. NSB Self-study, 1975

In 1975, a June long-range planning task force looked at the overall NSB objectives and the Board relationships to NSF, as well as the NSB organizational structure and practices. It recommended that the Board's activities should be moved more "towards policy concerns and increased effectiveness of its oversight responsibilities." It proposed that the Board play a larger role in national science policy issues and that it do so by increasing the efficiency of its activities and by delegating more awards approval responsibility to the Director. It also recommended that the Board establish a Policy and Planning Committee Subcommittee on Mechanisms for Improved Oversight and External Communications; that the Board implement its authority to hire staff; that NSF improve audit and management systems (which was done); and that the Foundation compile a compendium of NSB policy and procedural statements (which was only partially complied with).[40]

2. Statement by NSB Member Roger Heyns

In early 1976, the Board spent considerable time discussing procedures needed to improve the management of science education/curriculum development projects, review of proposals and adherence to Board enunciated policies in order to prevent future mismanagement episodes like that which occurred in the MACOS situation.[41]

During a closed executive session discussion of this issue, Dr. Roger Heyns remarked that the NSF had had 25 years of success and that great confidence had been placed in the staff. But as a result of the incident, he saw a need for increased "toughness" in NSF operations, and noted that the buck stops with the Board. Board Chairman Hackerman asked him to prepare a more detailed statement,[42] which the Board subsequently approved for inclusion into the record "as the sense of the Board."[43]

The sense of Dr. Heyns' statement was that over the years the Board had come to delegate considerable authority for program approval and management as the Foundation began to assume more responsibility for policy development. Recently the Foundation and the committees that had been created and given Board-related responsibilities had come in for considerable criticism including challenges of "actual instances of lack of integrity." The Board had not been as vigilant as it should have been and there had been ". . . a gradual, often imperceptible, relaxation of drive and diligence." More hard questions needed to be asked. The NSF should be prepared for "an increase in scrutiny and inquiry by the Board into all of the Foundation's operations." The Board should not manage, yet it should increase its oversight.[44]

This recommendation, coupled with the recommendations emanating from the PPC Subcommittee on Mechanisms for Improved Oversight and External Communications and from other groups the Board established after MACOS, led to a change in review procedures to require that staff present the Programs Committee with all peer review comments. It also led to Board refinement of audit and oversight procedures in the Action Review Boards. (See Chapter XIV.)

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[40] See Section C of Chapter VI.

[41] Program managers had deliberately chosen not to include adverse peer review comments in review procedure sequences and the Foundation was charged with inappropriately managing a curriculum distribution program whose contents offended some conservative religious believers. For additional details see Chapter XVIII on science education, below.

[42] ES : 179 : 16, minutes of Executive committee meeting of Feb. 20, 1976.

[43] ES : 180 : 4.

[44] Statement by Dr. Roger Heyns, 197 : 23–24. (See Appendix E.)

3. The "Hoff" Report, 1976

Shortly thereafter, the Director asked the William J. Hoff, a former NSF General Counsel, to prepare a report containing the historical record of the relationship and role of the Board and the Director and recommendations for certain operational changes. The report was sent to the Board on June 11, 1976.

Hoff's sketch of the history of the Board/Director relationship caused him to conclude that "there can be discerned a clear and persistent yearning on the part of both the Congress and successive Administrations for the Foundation, especially the Board, to perform a greater role in advising the Government on the needs of science, particularly basic science and scientific education, and in making recommendations of a policy nature looking towards fostering the strength of the nation's science. However, there is no longer any expectation that the Foundation will act as a coordinator." [45]

In contrast to the Heyns statement, which called for more program oversight, Hoff recommended a cutback in the Board's program approval role on the grounds that ". . . it is not feasible for a large part-time group to both give individual consideration to a multitude of research transactions and still give adequate attention to its policy role." [46]

Hoff recommended the following actions to enhance the Board's ability to determine NSF policies—what he viewed as the Board's basic mission. He recommended that NSB's burden of approving awards be repealed or severely limited by modifying section 5(e) of the Act. He said that NSB approval should be required only for awards "where existing policies do not clearly sanction approval." [47]

However, "in order to satisfy the responsibilities of the Board, complete sets of policies and procedures involved in the award of funds . . . should be prepared by the Director and be presented to the Board for discussion, amendment and approval." The policy compendium should set forth the "philosophy of the policies, leaving to the Director and staff the job of providing necessary detail in the course of administration." [48] The procedures compendium "should detail for each program the manner in which proposals are received or solicited, the manner in which reviews are made, the type of peer review, and the role of individual staff officers in exercising judgment in negotiations and in recommending approval. . . ." Procedures should be standardized and should include a method to screen and send to the Board even those proposals below dollar limits which require Board approval because of their policy implications.[49] Since Board policies can take many forms—reports, letters, formal resolutions, program approvals—he recommended that "... all policies relating to the Foundation be enunciated overtly and specifically by the Board and be adopted by formal resolution."[50]

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[45] Hoff, William J. The National Science Foundation: Board and Director. A Study Prepared for the National Science Foundation, May 28, 1976, p. 20. Sent to the Board on June 11, 1976, as NSB–76–199.

[46] Ibid., pp. 28–29.

[47] Ibid., p. 24.

[48] Ibid., p. 25.

[49] Ibid., p. 26.

Even though the budget is basically the responsibility of the Director, the NSB Budget Committee's role can be strengthened if "the Board can . . . make its views known before the budget process is reached, and should be able, over the course of time, to press its positions, primarily by issuing policy reports and appearing before the OMB . . ." or on occasion going directly to the President.[51]

Hoff also recommended that the Planning and Policy Committee be reconstituted as a Committee on National Science Policy charged solely with preparing recommendations to the Board for it to serve in developing national policies for the promotion of basic research and education in the sciences.[52] This should be the Committee's sole assigned task and "the policy committee should devote itself to problems and issues having . . . national reach, whether or not the Foundation could itself be expected to play a part in carrying out any recommendation."[53] In choosing issues to study, the Committee should keep in mind the needs of its potential users, who should be at the highest presidential and congressional levels. In addition, the Board should systematically follow-up on the issues it has dealt with.[54]

Furthermore, Hoff recommended that the Director should create a high level policy staff to support his and the Board's policy analysis needs, and that all Board business should be coordinated through the Executive Committee, which should be given more explicit and implicit authority.[55]

4. Ad Hoc Committee on NSF Review, 1979

The next assessment of the Board occurred in 1979. This was a two-part Board review, triggered by the announcement by the House Committee on Science and Technology in its authorization report for 1980, that it was initiating a review of the NSF organic act. A June 1979 long-range planning Task Group on "Review of the NSF Organic Act," dealt with 10 aspects of Board operations. Its recommendations were referred to the Ad Hoc Committee on NSF Review for further consideration.

The Board created the Ad Hoc Committee on NSF Act Review on April 20, 1979 and charged it with the responsibility for "... recommending to the Board its position on the NSF Act, for review by the Science and Technology Committee."[56] The Committee's report went through several versions, with members disagreeing especially about implications of how stringent or discretionary language defining NSF functions to support basic and applied research and the distinctions between these support areas should be. For instance, the minutes of the tenth meeting of the Executive Committee report the following comment on a draft version of the report:

> The Board Chairman stated that he would prefer that the report recommend "continued strong" support of applied research rather than "increased emphasis." He stated that this term could

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[50] Ibid., p. 30.
[51] Ibid., p. 32.
[52] Ibid., p. 34.
[53] Ibid., p. 35.
[54] Ibid., p. 88.
[55] Ibid., p. 39–31.
[56] CS : 111 : 19.

include special initiatives in applied research which the Foundation might decided to undertake.[57]

The NSB finally approved the report of the Ad Hoc Committee during its 211th meeting on November 15, 1979.[58] Its basic finding was that the Act did not require revision since it was flexible enough to have permitted the NSF to make a variety of changes over the preceding ten years.[59] The Committee concluded that future activities of NSF could be encompassed within the provisions of the Act. It also established as a "first priority for NSF . . . special and preferential support of basic research and education in science and engineering." The major points of the report as summarized by Dr. William Hubbard, Ad Hoc Committee chairman, are summarized in appendix F.

5. *Testimony of former NSF Staff and Board Members as Part of the House Committee on Science and Technology Hearings on Revisions in the NSF Organic Act, 1979*

A variety of other recommendations regarding the functioning of the Board have been heard over time, for instance, during the hearings of the House Committee on Science and Technology in 1979.

a. *Dr. Philip Handler.*—Dr. Philip Handler, former NSB Chairman, and President of the National Academy of Sciences, made two notable suggestions for change in Board practices in testimony of May 1979. First, he suggested that the Board's responsibility be restored for "full approval authority for all grants—and authority to delegate any or all of that authority to the Director as it had done in large part before the current provision was written into law. Only thus can it be held responsible—and be expected to act responsibly." Handler said that it was his experience that larger awards—which the Board is obliged to approve—are probably always better prepared and justified than are the smaller awards—for which the Board is permitted to delegate approval responsibility to the Director.

Dr. Handler also proposed that the Board take on a more important role in developing recommendations with national implications for science policy support, infrastructure, and funding, and that the Board use its annual report mechanism for this purpose:

> The functional role of the Board had long since departed from that of the ultimate approving body for grants. It should function as an antenna, bringing to the highest level of consideration at the Foundation the concerns of the Nation, the opportunities and the problems of research-performing institutions. The annual report of the Board is an excellent vehicle for this function. The Board should satisfy itself that the allocation of resources among Foundation programs optimizes the use of all Federal funds in support of research and [that funds] are wisely deployed to serve the educational function of the Foundation. In these senses, it should truly act as the "National Science Board" rather than the "Board of the National Science Foundation."[60]

b. *Dr. Thomas F. Jones.*—Former Board member Thomas F. Jones testified at the same hearings that the Board seemed overworked by awards approval responsibility and that the dollar limits for required Board approval should be raised. He also said that ". . . since the days of President Nixon the Board has been overinvolved in the Foundation and as a result of overinvolvement in administrative matters the Board's policymaking functions suffered. Specifically:

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[57] EC: 79-10: 5.

[58] CS: 211: 22.

[59] CS: 211: 29.

[60] Handler, Philip, "The National Science Foundation," Statement before the Subcommittee on Science, Research, and Technology, Committee on Science, Research, and Technology of the Committee on Science and Technology, May 17, 1979, pp. 22–24.

> I feel they have met much oftener than necessary and this has resulted in their involvement in administrative matters as well as policy matters.
>
> . . . As the governing body of the Foundation I feel the Board should keep at arm's length from the operations of the Foundation. The Board should look at larger questions and should generate policy with the guidance and assistance of the Director . . . Frequent meetings of the Board are an unnecessary burden to all—the Director, the staff, and the Board members.[61]

c. Dr. John T. Wilson.—According to Dr. John T. Wilson, a former NSF Deputy Director, and now President of the University of Chicago, the Board's inability to cope with policy issues as well as the multitude of administrative details should be alleviated by creating a new Board model—a small group that would work full-time and, in effect, serve as part of the NSF administrative hierarchy:

> I would suggest that a smaller group, functioning on a full-time basis, would be a more desirable management model than is the model of the 24-member part-time Board. Collectively the group, say of five or seven individuals, could serve the functions of policy formulation and guidance for the Foundation. Individually, each member of the group could assume the responsibility for administration of a major segment of the Foundation functions, with one of the group being designated as the senior member, to serve much in the same manner as does the current Director. The level of remuneration for all of the members of the group should be that of the current Director, and the senior members could be advanced one level, to enhance recruitment possibilities so that collectively the senior operating staff of the Foundation would be strengthened.

Wilson said that if it still seemed desirable to have a larger group, ". . . to be effective, that group should be associated with the Administration at a level where it can be effective, namely with the Office of Science and Technology Policy." The revised group would be a "reconstitution of the former President's Science Advisory Committee . . . [and it could] function across the spectrum of higher education and not be limited to science and technology." [62]

O. SUMMARY

This chapter on NSB responsibilities and procedures described the complexity of Board functions and operations. The concluding sections summarize critiques made by others of NSB/NSF operations and testimony delivered before the House Committee on Science and

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[61] Jones, Thomas F. Statement to the Subcommittee on Science, Research, and Technology of the Committee on Science and Technology, May 17, 1979, p. 18.

[62] Wilson, John T. Statement submitted to the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, Aug. 15, 1979, pp. 14–15.

Technology in 1979. In summary, these critiques and comments raise the following—sometimes contradictory—issues related to NSB:

The Board should improve and broaden its policy-making functions and the reporting and follow-up of its policy recommendations,

The Board needs to improve its oversight of the National Science Foundation,

The Board should make more visible its budgetary preferences for the National Science Foundation,

The Board should improve its programs award responsibilities by devoting more time to reviewing awards which contain new policy issues, rather than concentrating only on awards which exceed certain dollar limits,

The Board should be less involved in NSF's day-to-day operations, and

The Board should select a small group of its members to assume full time responsibilitiy to administer the NSF on a day-to-day basis.

IV. THE NSB EXECUTIVE COMMITTEE

A. Overview

The Executive Committee was created pursuant to statute. It is composed of the Director of NSF, who chairs the Committee, and four members elected from the NSB, including usually the Board Chairman and Vice Chairman and two additional members. The Committee was created to act on behalf of the Board between meetings. Subsequently, it also was given the functions of approving affiliations of the senior staff, approving nominees, coordinating and offering guidance on activities of the Board and its committees, serving as the agenda committee, identifying tasks for additional Board action and approving some new programs and awards.

From 1969–71, the Committee usually met when the Board did not. But beginning in 1971 the Executive Committee has tended to meet the evening before the Board's regular meting and an additional three to five times when the Board did not meet.

The Committee has another principal function—as a sounding board for the Director. This may explain why the Committee meets at the same time as does the full Board, but a comparison of minutes indicates some overlap and duplication in discussions. Recommendations have been made to give the Committee more responsibility to free the Board to spend more time on larger policy analysis tasks. However, such a plan probably would curtail access to detailed information that most NSB members believe is essential for oversight and planning, a dilemma which most boards confront.

The Executive Committee's statutorily required annual report does not summarize all the committee activities, nor is it an analytical document. The Congress may wish to inquire if the Board is complying fully with the statutory requirements regarding the preparation of an annual report, whether the annual report is superfluous, and whether the Executive Committee's functions ought to be re-evaluated.

B. Functions of the Executive Committee

The NSF enabling legislation creates as part of the Board ". . . an Executive Committee composed of five members; [the Board] may delegate to it, or to the Director or both, such of its powers and functions as it deems appropriate. The Director shall be the fifth member ex officio and the Chairman of the Committee." The statute required the Executive Committee to prepare an annual report for the Board, and other reports as it deemed necessary, and instructed that minority views and recommendations of the committee should be included, as warranted. Although the Board had an Executive Committee prior to 1968, it was never required to prepare an annual report and was not chaired by the Director. According to highly-placed NSF and NSB officials, during 1967 and 1968, when the Congress was considering the legislation to amend the NSF statute, OMB made serious attempts to disband the Board on the grounds that NSB interferes with presidential control over the Director and the NSF.[1] The apparent compromise was to create an Executive Committee, chaired by the NSF Director.

The legislation further states that "at each of its annual meetings, the Board shall select two of its members as members of the Executive Committee," to hold office for two years, The maximum consecutive length of time that a member can serve on the Executive Committee is six years. (Sec. 7.) Board rules of procedure specify further that "The Board Chairman and Vice Chairman by custom are elected to membership on the Executive Committee." Also in the last few years the chairman of the NSB Budget Committee customarily has been a member of the Executive Committee. This occurred especially in the period 1968 through 1974 when the Budget Committee was identical to the Executive Committee. Executive Committee meetings are closed. However, typically the NSB Executive Secretary attends the meetings, as does the Deputy Director of NSF and the NSF General Counsel, who both are members of the Director's Executive Council, another control device.

The Executive Committee of the NSB is extremely important to the Director, primarily because, as several NSF staff members noted,[2] the committee is his major instrument for influencing the Board as well as a sounding board for discussing, refining, or disposing of critical issues and policies before they are brought to the full Board.

The Executive Committee's functions have not varied in any significant way since 1968. The Executive Committee sets the Board's agenda, acts for the Board between meetings, approves senior staff appointments, help set NSB committee agenda, identifies tasks requiring Board action, gives preliminary review and approval to nominees before they are brought to the Board, and gives guidance to the Director on a myriad of issues never brought before the Board.

As noted above, the Executive Committee, beginning in 1968 also served as the Board's budget committee. However, in 1973 the budget function was removed from the Executive Committee and a separate Budget Committee was created. The formal Executive Committee functions, as of January 23, 1980, are:

1. Fulfill statutory functions: (*a*) . . . exercise such powers and functions as may be delegated to it by the Board. (*b*) . . . render an annual report to the Board, and such other reports as it may deem necessary, summarizing its activities and making such recommendations as it may deem appropriate. Minority views and recommendations, if any, of members of the Executive Committee shall be included in such reports.
2. Act on behalf of the Board between meetings on: (*a*) Grants, contracts, or other arrangements; (*b*) Other instances where immediate decision is required. (All such actions are reported to the Board at its next meeting.)
3. Consider and approve affiliations of Director, Deputy Director, and Assistant Directors.

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[1] Discussions with highly-placed NSF and NSB officials.
[2] Especially former NSF General Counsel Hoff.

4. Coordinate and offer guidance on activities of the Board and its committees.
5. Serve as agenda committee for the Board.
6. Identify subjects to be considered by task and ad hoc committees.[3]

C. TIMING OF EXECUTIVE COMMITTEE MEETINGS

Board rules of procedure specify that the Executive Committee shall meet on the Wednesday evening before each Board meeting, and on the third Friday of the months the Board does not meet, except that, in December, it meets on the second Friday. During the calendar years 1970 and 1971, the Executive Committee and the Board tended to meet separately. Beginning in 1971 and continuing to the present, the Executive Committee has met at the same time the Board does (usually the evening before) and in addition, on the average of three to five times per calendar year at times when the Board does not meet. Most of the separate meetings are held in December or in the months of July and August, when the Board does not meet. See table 7.

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[3] Memorandum to Members of the National Science Board. Subject: "NSB Committee Structure and Membership" Jan. 23, 1980. (NSB 80-45).

TABLE 7

Relationship Between Executive Committee and Regular NSB Meetings

Number of Meetings												
10												
9				N		N*		N*	N			N*
8				*	N		N*		*	N*	N*	
7					*							
6		N	N									
5		E			E		E					
4	NE								E	E		
3			E	E							E	E
2								E				
1												
0												
Calendar Year	1968 (6/12/68)	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979

N = total numnber of NSB meetings

* = number of times Executive Comm. and Board met concurrently (when the Executive Comm. meets no more than one day before the full NSB meeting)

E = number of times Executive Committee met separately from the NSB

Generally the Executive Committee and the full Board never met together in 1968, 1969 or 1970. Since 1971 a practice has begun for Executive Committee meetings to be held when full board meetings are held. Since 1971, an average of seven to nine meetings have been held together. Since then, the Executive Committee also has met additionally three to five times per year. Separate Executive Committee meetings generally are held in the summer months (July and August) and the December and January or February.

Source: Compiled from NSB minutes.

Economy, expediency, and the Executive Committee's role as a sounding board may compel the Executive Committee and the Board to meet at the same time that the full Board does. But a comparison of minutes raises questions about overlap and duplication between discussions held at meetings during the same months. The Executive Committee rarely approves programs, which is one of its principal statutory functions. This may raise questions about the need to define the Executive Committee responsibilities more precisely.

D. FORMAT OF EXECUTIVE COMMITTEE MEETING RECORDS

Executive Committee discussions are recorded three ways by the Board: a summary in the closed session minutes, a full rendition in minutes of the Executive Committee, and a short summary, without details, in the annual reports of the Executive Committee. The summary in the open session minutes is brief and without detail. For instance, the following report of the 10th and 11th meetings of the Committee in 1977 was made at an open session of the Board meeting. This summarizes actual Executive Committee sessions whose minutes consist each of six to ten single-spaced typed pages:

> a. *Executive Committee—77–10 and 77–11 Meetings—October 20 and November 16.*—Dr. Atkinson, Chairman, reported that on October 20 the Committee discussed organizational and staff changes; congressional and legislative matters; NSF budgets for fiscal years 1978 and 1979; NSB reports, forums, and schedule of meetings; preparation of reports transferred from OSTP; and proposed standards for staff and peer reviewers regarding disclosures of affiliations and interests.
>
> On November 16 the Committee discussed faculty salaries, geographic distribution, the Science Information Activities Task Force report, cryptography, fiscal year 1979 and 1980 budgets, *Handbook for Program Officers* (distributed at the Board meeting), Board reports, possible meeting with the President, and the NSF position on the proposed Department of Education. The Committee also approved the continued service of Dr. John B. Slaughter, (Assistant Director for Astronomical, Atmospheric, Earth, and Ocean Sciences) on the Minorities Committee of the Institute of Electrical and Electronics Engineers, Inc., and on the Committee on Minorities in Engineering of the Assembly of Engineering, National Research Council.[4]

E. ISSUES REGARDING THE FORM AND UTILITY OF THE ANNUAL REPORT OF THE EXECUTIVE COMMITTEE

The annual report of the Executive Committee is merely a short summary of selected discussions in the Executive Committee. It is not an analytical discussion of decisions made by the Committee. Furthermore, since it does not report on all items discussed, and omits the richness of detail included in the minutes, the full minutes need to be consulted to obtain an accurate rendition of what occurred. In addition, annual reports customarily do not include dissenting views as permitted by the NSF statute.

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[4] Section 14(b) of the NSF Act requires Board approval of the holding by the Director, Deputy Director, or any Assistant Director of any office in, or acting in any capacity for, any organization, agency, or institution with which the Foundation does business. At its 158th Meeting the Board delegated this authority to the Executive Committee (194:12).

For instance in the 1980 annual report, the description of the 11th meeting of the Executive Committee, in November 1979, included among its items:

> At the request of Dr. Saunders Mac Lane, the Committee discussed the effect on NSF of the undertaking of special projects imposed on the agency from external sources and the quality of recent NSF reports.[5]

However, the minutes of the Executive Committee note that Dr. Mac Lane also raised the issue of the effects on the core research program of special initiatives, the origin and implications of special initiatives, and with respect to the quality of NSF reports, a detailed discussion of the annual report prepared in NSF (by STIA) for the Office of Science and Technology Policy, Five Year Outlook and the inability of the NSF staff to cope wth the new burdens thrust upon them. The minutes of the Executive Committee on this one sentence take more than one page to report:

> At his request, Dr. Mac Lane met with the Committee to discuss several items of concern to him.
>
> The first was the effect on NSF of special projects undertaken often at the expense of other programs. Specifically, he had in mind the OMD Program, CARP, Industrial Innovation, DPR, and the U.S.-People's Republic of China Cooperative Program in Basic Sciences and related areas. Each of these activities is desirable in its own right but the total effect of a number of such programs could have unfortunate consequences to the core research program which has been carefully planned. With respect to the innovation activity, Dr. Mac Lane informed the Committee that several reports had been prepared or are under preparation under the auspices of the National Academy of Sciences (NAS). In his judgment these reports do not effectively determine whether or why there is now less innovation, nor do they show what steps could be taken to remedy the situation.
>
> There followed a general discussion of the origin of special initiatives, NSF's response to them, and the general policy question of the possible resultant change in NSF's future role if certain major activities are substantially altered. It was further noted that a "new" initiative in one budget year becomes an established activity in the next, thus altering the funding pattern considerably. The Committee also discussed the impact on NSF of a new National Technology Foundation (NTF) and the analogy to the establishment of the National Academy of Engineering under the charter of the NAS.
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> Secondly, Dr. Mac Lane stated that he was deeply concerned about the quality of the reports emanating from NSF.

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[5] 1980 Annual Report of the Executive Committee. May 7, 1980 (NSB-80-197). EC: AR: 6.

> Speaking from a background of much experience with reports, he stated that he had been increasingly discouraged about those NSF reports he had read recently. It was his opinion that the First Annual Report on Science and Technology (summer 1978) was poor, and that the draft of the Second Annual Report on Science and Technology is also of inferior quality. Then there is the massive first draft of the first Five-Year Outlook Report. It appears to be a confused shambles. He wondered why three successive reports prepared by STIA should seem so unsatisfactory.
>
> The Director stated that it had been a heavy burden on STIA to prepare these mandated reports with limited and changing staff. Unfortunately, not all the individuals were trained in the areas in which they are being asked to work.
>
> Again the Director stated his view that the legislation should be changed so that the Board is not required to render *annual* reports. Both the Board Chairman and Dr. Hubbard indicated that they felt the mandate provided the Board with an opportunity and channel to present its views on timely subjects.
>
> The Board Chairman stated that he would be agreeable to a change to permit the Board to render such reports "from time to time."[6]

Since full minutes are kept of the Executive Committee meetings and the annual report is only a partial and limited-distribution report the questions can be raised: Just what purpose does the report serve? Since minutes are kept of the Committee, meetings, documentation may be sufficient. Would the annual report be more useful if a special recipient were designated, such as Congress?

F. Example of Issues Considered by the Executive Committee

The types of discussion and decisions made in the Executive Committee meetings do not appear to have changed significantly since the annual report requirement was made mandatory. Examples of the issues considered by the Committee suggest the broad range of topics covered:

> *Decisions on Defense Base Act*
>
> The Committee discussed the implications for the Foundation and other Federal agencies of the results of a court decision on a case involving compensation for death while working on a civilian Government grant outside the continental U.S. The death was of a U.S. scientist working in the Antarctic on a NASA project, with NSF travel funds. The issue involved the provisions of the Defense Base Act as they apply to NSF grantees. Premiums for DBA often are 10 to 20 percent of the total payroll of a grant or contract covered by the Act, whereas ordinary workman's compensation runs one percent or less. The court decision was in favor of the claimant and was immediately appealed by the Federal Government.

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[6] EC: 79-11: 9-10.

The General Counsel discussed the possibility of seeking waivers for all scientific activities conducted abroad. One Board member suggested pursuing this through the legislative process.

The General Counsel was requested to compile total cost figures for NSF personnel abroad and bring this and other pertinent information with recommendations to the next meeting of the Executive Committee.[7]

The Director later told the Board that the Government's appeal was successful.[8]

Creativity Extensions of Awards

The Deputy Director told the Executive Committee that as a followup to the June task force meetings, the staff has developed an award mechanism entitled "Creativity Extensions" which could authorize the extension of an award for an additional three years (up to a total annual rate of $200,000), without added peer review to stimulate innovative research ideas. He asked members of the Board for their reactions. Members suggested that the limit be changed annually, that the program managers report to the Director and the Board on the use of such awards. According to the minutes "The plan will not require Board approval since it is a change in administrative procedures and not a new program before it can be implemented by staff, but it will be discussed by the Board at the August meeting."[9]

Awards to Federal Agencies and Their Contractors

As a result of concern in the scientific community the Director stated that he wanted to review the Foundation's general policy as contained in NSF Circular No. 108, "Support of Research, Science, Education, and Related Activities Performed by Other Agencies." The policy, in effect since at least 1972, prohibits support of research and related activities performed by other Federal agencies, their employees, or their contractor-operated laboratories and research centers except in pursuit of specific NSF objectives. The Office of the General Counsel had made some changes in the circular which were not intended to change the substance of the circular but the scientific community reacted negatively. The General Counsel presented four policy options for Board consideration; the Director indicated a preference for retaining the intent of the current version which is to permit exceptions in especially meritorious cases. The Board Chairman proposed that the Director bring the issue to the Board and also NSF's policies regarding support of researchers in industry. The Executive Committee proposed that the Board Chairman refer the issue to the Planning and Policy Committee for discussion. The staff would then formulate options or a recommended solution for the Board's action and refer them to the Board.[10]

Opposition to National Engineering Foundation

The Director stated that in recent discussions Rep. George E. Brown, Jr. had said he was considering introducing a bill to establish a National Engineering Foundation. Dr. Atkinson said his position on this matter, if asked to testify, would be that the present NSF organizational arrangement with its array of engineering and applied science and technology programs can provide adequate support and is preferable to a new entity.[11]

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[7] 1980 Annual Report of the Executive Committee, May 7, 1980. NSB 80–197, EC : AR : 3, and EC : 79–7 : 5.

[8] NSB 80–197, opt. cit., p. EC : AR : 11.

[9] EC : 79–9 : 10 and NSB–80–197, op. cit., p. EC : AR : 3.

[10] EC : 79–7 : 11 and NSB–80–197, op. cit., p. EC : AR : 3.

Director's Opposition to NTF Bill

The Executive Committee discussed the proposed National Technology Foundation bill. The Director commented on a meeting on December 10, 1979, which has been convened at NSF with the deans of engineering of 13 leading institutions. The deans had expressed sympathy with the intended purposes of the bill to Representative Brown who also attended the meeting. The deans were informed by the Director that NSF could manage doubling or even a two and one-half-fold increase in support for engineering sciences.[12]

Proposal Evaluation Form

A proposed revision in NSF's "Proposal Evaluation Form" was discussed by the Committee. The revision would elicit separate peer review comments on the principal investigator's (a) proposed research and (b) recent research achievements.[13]

Cost Sharing

The Committee was informed that an administrative change is being made in the method of cost sharing on NSF grants. The present requirement is for a minimum of 1 percent cost sharing on each grant resulting from an unsolicited proposal. Grantees will now be allowed the option to cost share in the aggregate rather than on each project.[14]

Avoiding Conflicts of Interest

The Committee discussed a draft Important Notice prepared as an NSF response to a directive contained in the Senate Committee on Appropriations reports for fiscal years 1979 and 1980 concerning grant administration. This proposed Important Notice covered consulting activities of senior investigators seeking NSF support and the adoption of appropriate procedures to avoid conflicts of interest possibly arising from those consulting activities.

The draft Important Notice would require prospective principal investigators to give notice in proposals submitted to NSF where a conflict of interest may exist. The Committee did not agree that the situation demanded the stringent steps proposed in the Important Notice. The Committee proposed that NSF take instead the positive position that it held the institution responsible for the activities of its faculty and agreed that a statement to this effect would be drafted for the Board's consideration.[15]

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[11] EC : 79–8 : 4 (Aug. 16, 1979) and NSB–80–197, op. cit., p. EC : AR : 4.
[12] NSB–80–197, op. cit., EC : AR : 7.
[13] NSB–80–197, op. cit., p. EC : AR : 9.
[14] NSB–80–197, op. cit., p. EC : AR : 10.
[15] EC : AR :12.

G. CONSIDERATION OF "HOFF REPORT" RECOMMENDATIONS TO STRENGTHEN THE EXECUTIVE COMMITTEE

In 1976 the former NSF General Counsel, William Hoff, prepared a report reviewing the functions of the Director and the Board, with a view toward streamlining and improving their operations. He recommended that the Executive Committee be given more responsibility. The Board should review its functions, he said, in order to "... isolate ... certain actions which could appropriately be delegated to the Executive Committee in an effort to clear more time for the Board to consider major policy questions." He also recommended that the Executive Committee should construct agendas in such a way that the Board could "be given the opportunity to refer a package of such matters to the Executive Committee for action".[16] Hoff also proposed that the Director create within his office a high-level policy analysis support group to serve the needs of the Executive, Budget, Programs, and Planning and Policy Committees. This group would be used to support the policy needs of the various committees as well as serve the vastly enlarged coordination and referral function he envisioned for the Executive Committee.

Were such a policy group to be established, Hoff reported:

> ... Requests from the Board, its committees or an individual member to have a problem explored, statistics prepared or analyzed, a staff paper prepared setting forth pros and cons or for assistance in preparing a report could be transmitted through the Special Assistant to the Chairman, to the Executive Committee. That Committee could exercise coordination and control over the work to be undertaken. A request as approved by the Executive Committee could then be forwarded to the Policy Group with appropriate Board staff supplying liaison to assure that the product will ... fulfill the needs of the initiator of the request. In this manner there would be a mechanism available for the Board and the Director to secure the necessary back up for formulating policy recommendations. At the same time, there would be no duplication of staff effort as all the existing staffs would be fully coordinated.[17]

Hoff's proposal was not adopted. Any attempt to streamline the Board's functions will confront the delicate balance the Board has tried to fashion between policymaking and "micro-management," that is, between spending so much time on details and administrative matters as to forfeit consideration of policy issues versus policymaking in an environment devoid of many details. Delegation of even more authority to the Executive Committee, as Hoff proposed, could prevent the Board members from obtaining information they apparently feel is needed to do their job. The Congress may wish to address this issue.

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[16] Memorandum to Members of the National Science Foundation. Hoff Report. NSB-76-199, referring to the attached report. The National Science Foundation: Board and Director, a study prepared for the National Science Foundation by William J. Hoff, May 28, 1976, pp. 39-40.

[17] Ibid., pp. 42-43.

V. THE PROGRAMS COMMITTEE AND THE BOARD'S AWARD APPROVAL RESPONSIBILITIES

The enabling legislation requires the NSB to review and approve large awards and other awards as the Board determines. The Programs Committee is the Board's primary mechanism for the review of proposed awards and programs that require Board approval. Before the Director can commit the funds involved or implement the new policies the Board must, as specified in sections 4(a), 5(d), and 5(e) of the National Science Foundation Act, as amended, give its approval. This chapter presents a description of the evolution of the responsibilities and procedures of the Board's Programs Committee, a description of the current status of Programs Committee responsibilities and procedures, and a summary of Programs Committee activities over the last decade as they relate to the Board's approval responsibilities.

A. Evolution of Programs Committee Authority and Procedures, 1968–1976

Following the enactment of Public Law 90–407 in July 1968, the Board organized its committee structure to include an Executive Committee, a Budget Committee, two proposal review committees, ad hoc committees as needed, and four policy committees.[1] One of the policy committees established was the Programs Committee, which was assigned to concern itself with current and proposed Foundation programs through such activities as:

Continuing review of long-term commitments,
Continuing review of the substance of on-going programs,
Review of proposed new programs,
Consideration of relative emphasis placed on programs and disciplines, and
Consideration of research programs relevant to national problems.[2]

Examples of the activities of the new Programs Committee was its involvement in stimulating the Board to plan new programs to meet "growing needs and expanding opportunities in the social sciences. especially several which are clearly designed to assist with the solution of society's most pressing problems." [3] In 1970 the Programs Committee devoted several meetings to in-depth consideration of graduate education in the sciences.[4] Other issues discussed by the Programs Committee during the period 1969 through 1971 include: science education, interdisciplinary research relevant to societal problems, the status of Government-supported research on human learning, and programs relating to national science policy considerations (for example, research facilities).

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[1] 120:3, 13–15.
[2] Ibid., p. 13.
[3] ES:128:8.
[4] NSB/PC–70–5, July 21, 1970; NSB/PC–70, Oct. 30, 1970; and NSB/PC–70–16, Nov. 19, 1970.

1. *Establishment of Current Programs Committee*

At the Board's annual consideration of NSB committees in May 1971, the Chairman reported that the Executive Committee had reviewed the functioning of the Board and its committees and recommended a reorganization establishing the new major committees to replace the current standing committees.[5] The Executive Committee felt that the reorganization would "free the Board of routine matters so that it can devote more time to the consideration of major policy issue."[6] The Board approved, with minor modification, the new committee structure, which included a new Programs Committee.[7] At its next meeting the Board approved the following functions for its new Programs Committee:

Develop and review proposed programs,

Monitor existing programs and activities,

Review on a continual basis the substance and trends of the RANN program,

Review all proposals for support prior to presentation to the Board, and

Maintain oversight on long-term commitments of the Foundation.[8]

A major difference between this Programs Committee and the previous one was that the new Committee became responsible for reviewing all proposed NSF programs and all project proposals requiring Board approval under Section 5(e) of the NSF Act as amended. As a result of this added responsibility, the new Programs Committee began to meet more often, to meet for longer periods of time and to concentrate much less on policy issues than did the former Programs Committee. This change was to be expected since the former Programs Committee operated in addition to two proposal review committees, whose functions were combined with those of the new Programs Committee. The new committee consequently devoted its time almost exclusively to reviewing proposals, and spent little time contemplating broad policy issues concerning program development.

The Programs Committee (PC) did establish three programs subcommittees which operated during late 1975 and the early part of 1976. However, this was the only time the newly constituted PC set up such subcommittees. They were:

the Subcommittee on Energy, which reported to the Board as NSB/PC-75-13,

the Subcommittee on Environmental Programs, which reported as NSB/PC-75-28, and

the Subcommittee on Social Sciences which, among other things, circulated a report prepared by Dr. Donald Stokes, Chairman of Task Group No. 10 of the Advisory Committee for Research, entiled *The Social Sciences as a Research Area in the National Interest.*[9]

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[5] **ES :139, 2–3.**
[6] **Ibid., p. 11.**
[7] **Ibid., p. 2.**
[8] **ES : 140 : 16, 32.**
[9] **ES : 177 : 10.**

2. *Section 5(e) Review and Approval Requirements*

Section 5(e) of the NSF Act as amended by P.L. 90–407, imposed the requirement that the Board approve all NSF awards for scientific activities which involve a total commitment of $2 million or more, or $500,000 or more in any one year. On July 20, 1968, immediately following the enactment of Public Law 90–407, the Board adopted a resolution authorizing the Director and the Executive Committee to review, approve, and take final action on contracts, grants, or other arrangements pursuant to the terms of Section 5(e). The resolution, as subsequently amended at the Board's 123rd meeting on February 13–14, 1969, reads as follows:

> The Board unanimously RESOLVED, that, in accordance with the provisions of Section 5(e) of the National Science Foundation Act, as amended, the Director of the National Science Foundation may make a contract, grant, or other arrangement, pursuant to Section 11(c) of the Act, as amended, without the prior approval of the Board, wherever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year, and the award is made pursuant to an established program of the Foundation;
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> RESOLVED, further that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board shall [act] for the Board in those rare instances, including the approval of grants, contracts or other arrangements, where immediate decision is required between Board meetings; and where the necessary action is not encompassed within the authority of the Director; . . .

On June 27, 1970, the Director issued a staff memorandum (O/D 70–20), to implement the NSB resolution regarding NSF grants and contracts. The memorandum specified the form to be taken for proposed projects or programs presented to the Board for approval. The directive also required that any award which could reasonably be expected to exceed $2 million would have to be submitted for Board approval, as would, in most cases, awards falling just under the dollar limits specified in Section 5(e). With respect to new programs, the memorandum required that proposed program guidelines first be submitted for Board approval. All initial grants under the new program would then have to be submitted for Board approval irrespective of the dollar amounts involved. The memorandum continued, "When it is believed that a sufficient number of proposals have been approved by the Board to define the general parameter of the program, then the Board may be requested to authorize the application of the Director's general authorization to approve grants to the new program."

In June 1973, the Board agreed that each resolution of the Board approving the Director's commitment of a specific amount of funds shall, unless otherwise indicated, be deemed to include approval for the Director, at his discretion, to increase the award by up to ten percent of the initial amount or to change its expiration date.[10] In February 1974 the Board amended its original 1968–1969 resolution regarding grants and contracts to incorporate this agreement.[11]

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[10] NSB–73–170, June 18, 1973.

[11] NSB–74–95, approved at the 162nd NSB Meeting on February 21–22, 1974.

The new resolution also broadened the Executive Committee's authority to act on behalf of the Board between Board meetings, giving that Committee full and unconstrained awards-approval authority between Board meetings.

Under the guidelines specified by the Board and the Director, the NSF directorates submitted to the Programs Committee all those proposals for new programs and project support which required Board approval. In 1974, an NSF staff analysis indicated that, since the 1968 amendment of the NSF Act establishing Board approval requirements with specified dollar limits, "inflationary factors and increased appropriations have added to the number of awards which require the Board's prior approval." [12] The study presented the table of totals for Board-approved awards and their associated dollar values as follows:

NUMBER OF AWARDS APPROVED BY NSB BY YEAR

	$500,000 in 1 yr	$2,000,000 total	Total
Fiscal year:			
1969	33	8	41
1970	30	18	48
1971	42	16	58
1972	29	45	74
1973	62	16	78
1974			[1] 82
1975			[1] 107

[1] Estimate.

The increased total for the years 1972 and 1973 coincided with the initiation of NSF's Research Applied to National Needs [RANN] Program. The study concluded that:

> This trend is overburdening both the Board and the staff. As can be seen by the above, 1973 cases were almost double those of 1969. The appropriate way to reduce this workload would be to increase the limit on cases which do not require NSB approval. . . . [D]oubling the current limits would get us back to our fiscal year 1969 workload level.

The staff study was examined by the NSB Executive Committee, on whose recommendation the Board subsequently authorized the Director to seek congressional action to remove the statutory dollar limitation on its power to delegate project approval authority to the Director, with the understanding that the Board would continue to review programs and individual projects when it considered such review to be desirable.[13]

3. The Impact of the MACOS Incident

In early 1975, NSF policy in the area of curriculum development became a matter of congressional concern which ultimately had a significant impact on the procedures of the Programs Committee. In the spring of 1975, the Director brought this matter to the attention of the Board, stating that it was "particularly troublesome." [14] The issue of particular concern to several Members of Congress was NSF's support of a project entitled "Man: A Course of Study," or MACOS. MACOS was one of 16 major precollege course curricula in various scientific fields under development with NSF support at that time. NSF had funded precollege scientific course development projects since 1956. MACOS was a social studies course for school children in the fifth and sixth grades, developed at a cost of $3.5 million and selected for use in over 1,700 schools in 470 school districts. Congressional concern arose after public disagreement had taken place over the use of MACOS in a few schools. The disagreement focused on the contents of the MACOS course and on NSF's role in its development and distribution. MACOS used studies of selected animal groups and the Netsilik Eskimos—a simple human society—to explore the roots of human social behavior. The appropriateness of using these subjects as a vehicle to discuss human social behavior received criticism. Also criticized were the procedures used by NSF to select the MACOS project for continued support and to market the final product for use by schools at the local level.

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[12] NSB-79-91, Mar. 10, 1974.
[13] ES: 163: 11.
[14] ES: 171: 6-9.

The Director proposed and the Board agreed that MACOS funding for the remainder of fiscal year 1975 and all precollege science course development or implementation funding for fiscal year 1976 would be suspended until NSF concluded a thorough review of its effort in these areas and reported to the Board and the Congress with recommendations.[15] At that time the Board Chairman appointed two Board members to the NSF review team on MACOS, and observed that "these recent events highlight the need for the Programs Committee to exercise its oversight role to a greater degree with respect to ongoing programs." [16] The Director stated at the Board's next meeting that it was his personal opinion that amendments to place congressional controls on the support of basic research by NSF and the mission agencies introduced during floor consideration of NSF's fiscal year 1976 authorization bill (called the Bauman amendment), were attributable in part to the Member's frustration regarding MACOS.[17]

At the Board's May 1975 meeting, a draft report of the NSF Science Curriculum Review Group was presented to the Board. It called for a reexamination of the policy framework and management procedures regarding the pre-college curriculum development program at NSF.[18] One month later the Board adopted three policy statements concerning NSF's curriculum development activities. NSF's role in the implementation of science curricula whose development it sponsored, and NSF's role in maintaining pluralism in science education.[19] After evaluating the NSF and General Accounting Office investigations of the MACOS project, the Director presented a lengthy statement regarding MACOS and related issues to the Board at its February 1976 meeting.[20] The Director's statement included the following observations regarding deficiencies in NSF procedures that contributed to the MACOS controversy and steps to correct those deficiencies:

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[15] Ibid. See also U.S. General Accounting Office. Administration of the Science Education Project "Man: A Course of Study" (MACOS). report to the House Committee on Science and Technology. (Report MWD-76-26). Washington. October 14, 1975. 59 p.: U.S. National Science Foundation. Pre-College Science Curriculum Activities of the National Science Foundation. Vol. II Appendix: Report of Science Curriculum Review Team. Washington. May 1975. 176 p.: U.S. National Science Foundation. Directorate for Science Education. Panel Evaluation of 19 Pre-College Curriculum Development Projects. (Report NSF 76-23) Washington. December 8-12. 1975. 609 p.; and U.S. Library of Congress. Congressional Research Service. *Man: A Course of Study* (MACOS), report by Langdon T. Crane. Washington. July 19. 1976. 101 p.

[16] ES: 171: 9.

[17] ES: 173: 5. The bills referred to were H.R. 4723 and H.R. 5796. 94th Congress, 1st Sess.. the bills are discussed in chapter IX, section D.

[18] ES :173 :4-7, May 15-16, 1975.

[19] NSB-75-226-228. ES :174 :21-23.

[20] ES :179 :17-24.

> It soon became clear to the Board and the Director . . . that there were administrative practices and policies which were weak and that the advocacy attitude of our NSF program people had clearly led to stronger support of some projects than was justified [and some misuses of data by personnel]. The Board's own action of eliminating the paraphrasing of reviews as they are sent to the principal investigators, and the ready availability of the original reviewers during the course of Board Programs Committee meetings are two steps. My own establishment of Action Review Boards in all the directorates is another. . . . Certainly an important move we have made is to change thoroughly the management people in the Science Education Directorate.[21]

Board Member Dr. Roger W. Heyns issued a statement expressing the sense of the Board on issues arising in the wake of the MACOS incident. The "Heyns statement" called for a significant change in the operation of the Board and its Programs Committee, particularly regarding the extent to which the Board was to become directly and indirectly involved in the "day-to-day operations" of the Foundation.[22] See appendix E. The full Board also established a group to review procedures. Its report together with the "Heyns statement" was a clear explanation of the new procedures set forth by the Board and the Director that would govern certain aspects of NSF's proposal and program reviews. The major changes that were introduced at that time were: (1) eliminating the paraphrasing of project peer reviews used in the NSB approval process; (2) providing Programs Committee members with original, verbatim peer reviews;[23] (3) establishing Action Review Boards in all NSF Directorates to perform the preliminary review of proposals to be submitted for Board approval; (4) establishment of a Director's Action Review Board to perform a second preliminary review of proposals to be submitted for Board approval; and (5) increased Board oversight of NSF operations. (See chapter XIV.)

4. *The "Hoff Report"*

As a result of the MACOS incident, the Director did not approach Congress with a suggestion to amend section 5(e) of the NSF's organic act, to eliminate work overload, as the Board had requested him to do in March 1974. Apparently he felt that it would not be opportune to approach Congress with a request to allow the Board more discretion in delegating its Section 5(e) approval authority to the Director while MACOS was receiving congressional attention. However, the Director retained interest in altering the Board's role in approving individual transactions. Momentum for such a change came primarily from the Director's Office, rather than from the Board. It will be recalled that the March 1974 Board request for the Director to seek a change in the Section 5(e) language was based upon recommendations from the Executive Committee after it reviewed a staff study of workload involved in Board approvals of individual transactions. The Executive Committee is chaired by the Director of NSF. In 1976 this issue reemerged when the Director requested Mr. William J. Hoff, former NSF General Counsel, to prepare a report containing the historical record of the relationship and the role of the Board and the Director and recommendations for operational changes.[24] The "Hoff Report" concluded that a determined NSF effort should be made to repeal section 5(e) of the NSF organic act in order to enhance the effectiveness of the Board as a deliberative policy-making body:

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[21] Ibid., p. 18–19.

[22] NSB :ES :179 :25–26, Feb. 20, 1976. Dr. Heyns' statement as presented in the February minutes represents a revision of his original remarks dated March 24, 1976. The Board approved by Dr. Heyns' statement as reflecting the sense of the Board at its next meeting, NSB :ES :180 :4. March 18–19. 1976.

[23] As of March 1976, according to interview with Leonard A. Redecke, Executive Secretary of the Program Committee.

> . . . [T]his burden must be eliminated by legislative action or be materially eased by effective procedures, if the Board is to have the time required to function to its full potential as the policy body for the Foundation and as a source of policy recommendations relating to the strengthening of the basic research and scientific education effort of the country.
>
> . . . *[I]t is recommended that a determined effort be made at the appropriate time to have Section 5(e) removed from the Act. . . . [but] that whether or not the requirement of the Board approval is repealed, the Board should severely limit its participation in the review of proposed grants and contracts for scientific activities.*
>
> . . . [I]t is not feasible for a large, part-time group to both give individual consideration to a multitude of research transactions and still give adequate attention to its policy role.[25]

The report went on to propose that in order to facilitate Board operations in the absence of Section 5(e) approval requirements, "complete sets of policies and procedures involved in the award of funds for scientific activities" should be prepared by the Director and approved by the Board. The proposed policy compendium would contain all significant Board policy resolutions which might arise in making awards under approved programs, as well as programs for which Board approval (with general delegation to the Director for making final actions) is in effect. The proposed procedures compendium would detail standardized procedures for NSF receipt, solicitation, peer review, NSF staff review, and Board review and approval of projects for all programs. Hoff's procedures compendium proposal, as it relates to Board procedures, has been implemented through NSF Circular 107 (see appendix G). Hoff's policy compendium proposal was partially implemented in 1976 when the Board initiated a biennial review of delegations of authority to the Director and/or the Executive Committee, including general delegations to the Director for taking final actions on awards for projects under specified programs. Also initiated by the Board in 1976 was a project to develop a compendium of NSB policy resolutions for the period 1968 to the present. At the Board's direction, NSF's General Counsel prepared a 21 page compendium of summaries of various Board resolutions made during 1968–1976. However, this compendium has not been updated as of February 1981.

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[24] NSB-76-199, Memorandum to Members of hte National Science Board, June 11, 1976.

[25] Hoff. William J. The National Science Foundation: Board and Director. A study prepared for the National Science Foundation, May 28, 1976, 44 p., at p. 22–24. (Italics in original.)

B. CURRENT STATUS OF PROGRAMS COMMITTEE RESPONSIBILITIES AND PROCEDURES

At present the Programs Committee consists of ten Board members plus one member who serves as a liaison with the Executive Committee. The Programs Committee and the Planning and Policy Committee, both with ten members, are the largest of the Board's committees. The latter two committees have no members in common. As currently defined, the responsibilities of the Programs Committee are to:

1. Review proposed programs and make recommendations to the Board.
2. Review all proposals for support containing new policy issues or over certain dollar amounts prior to presentation to the Board with Committee recommendations.
3. Monitor existing programs and activities.
4. Maintain oversight on long-term commitments of the Foundation.
5. Schedule formal and informal reviews of programs, especially for input to discussion of the [annual] Planning Environment Review at the long-range planning meetings.[26]

These responsibilities are slightly different from those outlined for the Committee in 1971, the most notable differences besides those relating to the RANN Program being the addition of informal program review responsibilities and the deletion of responsibility relating to program *development* as opposed to the review of proposed programs.[27] At various times prior to July 1977, the Programs Committee also had the function of reviewing for the Board proposed appointments to major NSF advisory bodies. See chapter XII. The "certain dollar amounts" mentioned refer to Section 5(e) requirements as elaborated by a 1977 Board resolution updating its previous resolution of February 1974 on grants and contract. The 1977 resolution appears below:

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 189TH MEETING ON APRIL 21-22, 1977

AUTHORIZATION TO THE DIRECTOR AND THE EXECUTIVE COMMITTEE OF THE NATIONAL SCIENCE BOARD TO REVIEW, APPROVE, AND TAKE FINAL ACTION ON GRANTS, CONTRACTS, OR OTHER ARRANGEMENTS

The Board unanimously RESOLVED that:

(1) The Director of the National Science Foundation, without the prior approval of the National Science Board, may make a grant, contract, or other arrangement whenever such an award involves a total commitment of less than

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[26] NSB—79-259, July 25, 1979.

[27] Cf. Section 5(d) of the NSF organic Act as amended by P.L. 90-407, specifying that "The Formulation of programs in conformance with the policies of the Foundation shall be carried out by the Director in consultation with the Board."

$2,000,000 or less than $500,000 in any one year and the award is made within an established program of the Foundation previously approved by the Board.

(2) Each standard grant, continuing grant, cooperative agreement, contract, or other arrangement (as defined in staff memorandum O/D 76-42, dated August 2, 1976) is to be considered separately and as a whole in determining whether the commitments involved exceed the $2,000,000 cumulative limit or the $500,000 annual limit. But, if simultaneous or successive awards are to be made for the same principal investigator based on only a single complete peer review or a single procurement, the simultaneous or successive awards shall be considered to constitute a single award in determining whether either limit is exceeded. Such successive awards based on a single complete peer review or a single procurement are to be considered as involving a total commitment of more than $2,000,000 as soon as program staff anticipates that the total ultimately committed is likely to exceed $2,000,000.

(3) The Executive Committee of the National Science Board may approve grants, contracts, or other arrangements where Board approval is required, or otherwise act for the Board in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director.

(4) When the National Science Board approves the commitment by the Director of a specific amount of funds by grant, contract, or other arrangement, unless the Board specifically states otherwise, the Director may at his discretion subsequently amend the instrument to commit additional sums, not to exceed 10 percent of the amount specified, or to change the expiration date of the instrument.

(5) This resolution supersedes and replaces the resolutions of the Board on this subject adopted in July 1968 and amended in February 1969 and February 1974.

The 1977 Board resolution was implemented by NSF staff through NSF Circular 107 (revision no. 2), which appears in appendix G. Circular 107 is currently in effect at the Foundation.

The procedures used for processing award recommendations and other items requiring Board approval or review are presented in Circular 107. The items presented for Programs Committee consideration are identified by NSF staff according to the criteria listed in Section 3 of the circular. Proposed programs and awards received preliminary review at the Directorate and Director's Office levels through directorate Action Review Boards and the Director's Action Review Board (DARB), respectively. Items for Board review and/or approval are routed each month to the Programs Committee members via the NSB executive secretary several weeks prior to the Committee hearings. This monthly information packet generally contains from 8 to 15 "program packages" of up to 100 pages of descriptive material and peer reviews relating to the items submitted for Board approval. Thus, Programs Committee members receive monthly pre-meeting packets containing 500 to 1000 pages of information. Amounts of time spent going through this preparatory material have varied from member to member, and different committee members have tended to focus on different review items during Committee deliberations.[28]

1. Programs Committee Meetings

Typical Programs Committee meetings are devoted primarily to the review of proposed programs and awards. These are presented as proposed Board resolutions approving a particular award, set of program guidelines, or delegation of authority to the Director to make awards under a certain program.[29] Such proposals are submitted to the Committee in groups corresponding to the directorates they originated from. The Committee generally receives two to five such packages per meeting. Information items and informal program reviews from particular directorates are often grouped for presentation along with the "action items" from these directorates. NSF managerial staff involved with the items for presentation are brought into each meeting to discuss the items on the agenda. Staff presentations for proposed programs and awards generally are entirely positive in tone. The Director relies on directorate Action Review Boards and the DARB to minimize the possibility that a "weak" or undeserving proposal might be submitted to the Board for approval. The staff, in effect, try to "sell" their proposals to the Board via the Programs Committee. After each presentation, Programs Committee members question the staff regarding various aspects of the proposal. Topics discussed include project administration, performer competence, program direction and needs, and related considerations. Staff members spend considerable time presenting their award packages. Committee members usually initiate only little discussion. On certain award proposals, however, particular Committee members may initiate intense discussion of particular details. On some occasions, especially during discussions of large, new projects, such as the Ocean Margin Drilling program, and the Mathematical Sciences Institute, questions of general science policy bearing on Programs Committee proceedings arise and are discussed in detail by the Committee.

After staff presentations and committee questioning, the staff members are dismissed and the committee convenes in executive session in which individual action items are again briefly discussed and voted on individually. The Programs Committee refers approved items to the full Board, usually on the following day, for Board approval to be recorded as a Board-approved resolution in the NSB minutes. Items voted down by the committee also are referred to the full Board, but without the recommendation of the Programs Committee. Voting is often unanimous, although dissenting committee members generally stick to their positions and do not appear to be persuaded to vote affirmatively for the sake of unanimity. Abstention is required in cases of conflict-of-interest, which are identified beforehand during the scheduling process.[30] In addition to voting to recommend approval or disapproval to the Board on particular action items, the Programs Committee has, on a number of occasions recommended that consideration of particular action items be delayed or that a revised or amended resolution be approved by the Board instead of the original resolution prepared by NSF staff. Deferred consideration is recommended to the Board primarily on grounds of (1) a Programs Committee requirement for more information, (2) time needed for a program to become established, or (3) workload constraints. Revised resolutions recommended to the Board have been designed primarily to (1) reduce authorized funding for a project or new program, (2) reduce the authorized time period for funding a project or new program, (3) condition the continuation of a project on the receipt of certain information, (4) condition the continuation of a project on its technical success, or (5) terminate a project in a way that does not involve a specific resolution disapproving that project.

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[28] Interviews with NSB staff (3/21/80, 1/26/81), and generalization from a reading of the Minutes of the Programs Committee, 1971–1980.

[29] The following summary is based on an analysis of the minutes of the proceedings of the Programs Committee for the years 1971–1980.

After the Programs Committee reviews a proposed approval of general guidelines for a new NSF program, and after the Board has approved such a proposal, the Programs Committee continues to submit proposed awards under that program for Board approval until the Board grants a more permanent approval by authorizing the application to such program of the general "delegation" of the Board's awards approval authority to the Director. At this time such a program becomes "an established program of the Foundation" approved by the Board.[31] The time between the Board's initial approval of a program's general guidelines and the Board's general delegation for that program varies from several months to one year or more. Subsequent to the Board's general delegation for a program, the Board must still continue to approve individually awards under that program which are above the Section 5(e) dollar limits.

Since May 1976 at the request of the Chairman of the Board, the Board has conducted a biennial "Review of Delegations of Authority from the Board to the Director and/or the Executive Committee."[32] Included in this biennial review is a listing of all established programs of the Foundation in effect at that time along with an identification of all those new programs established since the previous biennial review. At the conclusion of each of the three biennial reviews since May 1976, the Board has passed a resolution affirming the outstanding delegations of authority to the Director and/or Executive Committee and affirming the continued application to the programs listed of the Director's general authority to make awards. These biennial affirmations have served as a formalized record of Board actions.

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[30] Conflicts are identified according to considerations laid out in NSB–73–226, as amended. See Appendix B.

[31] Because of the language of Section 5(e) of the NSF organic act as amended by Public Law 90–407, the Board's authorization referred to in the text might not be a "delegation of authority" in the strict, legal sense of this term. The Board, under section 5(e), always retains awards approval authority. However, the Board's April 1977 resolution and its predecessors have been perceived as delegations and have been treated as such by the Director.

[32] NSB–76–165, May 19, 1976; NSB–78–217, May 11, 1978; and NSB–80–189, May 8, 1980.

2. *Informal Program Reviews*

In October 1973, the Programs Committee agreed to request various segments of the Foundation to give informal reviews of their programs.[33] In April 1977, the Committee discussed the Board's project review process and decided that the committee's review procedures should be broadened. The committee agreed to experiment with a random project sampling procedure within the framework of its informal program reviews, despite the possibility that NSF staff might perceive this as a "check" on staff works.[34] The staff were directed to provide a list of recent awards and declinations for each project under informal review, five of which were to be selected for committee review. Within the last several years, Informal Program Reviews (IPRs) have become a regular part of the Programs Committee's activities. Through this procedure the committee examines, on a sample basis, some of the proposals which would not normally come to the attention of the NSB as an approval or policy-related item. (IPRs are currently conducted by the Programs Committee under requirement 3.b.(4) of NSF Circular No. 107.) While the full NSB, including the Programs Committee, attends some of the formal Director's Program Reviews, the Programs Committee uses the informal reviews to carry out its oversight function, review specific transactions, and learn about trends in recent breakthroughs, and about the "cutting edge" of research in certain areas. In addition, the IPR enables Programs Committee members to meet some Program Managers who might not otherwise interact with the NSB.[35] The IPRs are relaxed and informal and are reported briefly to the full Board. Presentations for each program element selected by the committee last about 30 minutes and include two examples each of awarded, declined, and pending project proposals. A project summary, program recommendation, budget, and peer reviews are provided for each of these six items normally reviewed for each program. A list of recent IPRs is presented in table 10 at the end of this chapter.

C. ANALYSIS OF PROGRAMS COMMITTEE WORKLOAD AND RELATED BOARD ACTIVITIES

An analysis is presented below of the workload of the Programs Committee relating to awards approval, programs approval, informal project reviews, and policy considerations. This analysis of activities related to awards approval includes a discussion of the full Board's activities in response to Programs Committee recommendations.

1. *Proposal Review and Approval Activity*

Presented in table 8 is a summary of data regarding the proposal and recommendation activity of the Programs Committee for the years 1972–1979. Summary statistics are provided for these eight years because they represent the full years of operation for the current Programs Committee at the time of this analysis. (Created in May 1971, the current Programs Committee met only three times in the remainder of that year.) Although statistics for 1980 are not available, no change is understood to have occurred in the committee's operations to date.

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[33] NSB/PC :19 :2, Oct. 18, 1973.

[34] NSB/PC :15 :2–3, Apr. 20–21, 1977.

[35] National Science Board. Programs Committee. National Science Board Programs Committee Informal Program Reviews : memo by Leonard A. Redecke (Executive Secretary, Programs Committee), Mar. 13, 1979. 2 p.

TABLE 8.—PROGRAMS COMMITTEE PROPOSAL REVIEW SUMMARY, CALENDAR YEARS 1972-79

Item	1972	1973	1974	1975	1976	1977	1978	1979
1. Programs Committee sequence numbers	4–11	12–20	21–27	28–34	35–43	45–53	54–60	61–68
2. Total number of meetings	8	9	7	7	9	9	7	8
3. Proposals recommended for approval (see text)	195	129	113	120	92	76	64	54
4. Amount committed (in millions of dollars)[1]	237.2	191.0	206.3	306.8	290.1	298.8	343.9	284.2
5. NSF appropriations obligated (in millions of dollars)	601	611	644	768	715	776	863	912
6. (4) as a percentage of (5)	39	32	32	40	41	39	40	31
7. Proposals not recommended for approval	[2] 3	[3] 12	0	0	[4] 1	[5] 3	[6] 1	0
8. Proposals for which deferment of Board actions was recommended	[7] 1	6	3	0	0	1	3	2
9. Proposals recommended with revision (included in (3))	0	0	[8] 1	3	2	[8] 6	[8] 4	4
10. Proposals recommended, but with condition (included in (3))	0	0	0	3	2	6	1	0
11. Time spent on meetings (total hours)	27½	32¼	27¼	35¼	34¼	58¼	49	39¼
12. Time spent per meeting (average, in hours)	3½	3½	4	5	3¾	6½	7	5
13. Annual average amount of time spent per proposed recommendation in hours (derived from line 3 divided by line 11)	0.14	0.25	0.24	0.29	0.37	0.77	0.77	0.73

[1] Includes funds committed over multiyear periods.

[2] Represents 3 proposals withdrawn by NSF staff after presentation to Programs Committee.

[3] Includes 1 proposal withdrawn by NSF staff after presentation to Programs Committee. The other 11 proposals were subsequently conditionally approved by the full Board.

[4] Subsequently adopted by the full Board, which thus voted to disapprove the project.

[5] Represents a revised proposal eliminating three individual projects within a large coordinated program, the remainder of which was conditionally recommended to the full Board. The Board approved the revised conditional resolution.

[6] This proposal for a program initiation did not involve a dollar amount. The Board overruled the Programs Committee and approved the proposal in a modified form.

[7] Represents a proposal temporarily withdrawn by NSF staff after presentation to the Programs Committee.

[8] Includes 1 proposal recommended conditionally as well as with revision.

Source: Compiled from NSB Programs Committee minutes, 1972–79.

Certain aspects of table 8 need to be explained for adequate interpretation of this information. Item 3 of table 8 ("Proposals recommended for approval") represents a summation of those action items that were recorded in the Programs Committee minutes as "recommended proposals" and so reported to the full Board. Item 3 does not represent either the number of resolutions of recommended project approval submitted to the Board by the Programs Committee or the number of affirmative Committee votes recommending projects for Board approval. This is because the Programs Committee, like the full Board, often votes on resolutions of approval for a group of related projects constituting a "coordinated program of scientific research" under Section 3.a.(6) of NSF Circular No. 107. (This practice occurred regularly prior to NSF Circular No. 107 as well as subsequent to it.) These groups contain from 2 to as many as 40 or more individual projects, but typically range from 3 to 10 projects. Sometimes some or all of the individual projects of a "coordinated program" will each exceed the dollar limits specified in section 5(e) of the NSF Act. Whether or not any of the individual projects in a "coordinated program" exceed the dollar limits, peer reviews are required for each of the individual projects and are supplied to Program Committee members for review.

A recommendation by NSF staff for approval of a group of large projects generally has been presented to the Programs Committee (and so reported in the PC minutes) as a number of recommended proposals, whereas groups of smaller proposals generally have been presented as a single recommended proposal. Furthermore, certain recurring sets of proposed projects, as with the Materials Research Laboratories and the National Centers funded by NSF, are sometimes grouped together as a "coordinated program" and sometimes treated as individual projects. To make matters more complicated, Programs Committee members (and, later, all Board members) have, on occasion, voted individually on projects within a "coordinated program" when conflicts of interest have arisen (in which case the member with the conflict has abstained) or when objections have been raised to one or more of the individual projects within such a program.

For all these reasons, the summary data presented in item 3 of Table 8, and similar summary data gathered by NSF staff and presented elsewhere in this chapter are difficult to interpret and are not especially reliable for establishing trends regarding Programs Committee or NSB workload. Estimates of workload relating to awards review and approval are more reliably based on summary data for time spent on Programs Committee meetings (items 11 and 12 of Table 8). It is difficult to estimate the time spent on awards approval by the full Board because the closed (executive session) and open Board minutes are not broken down by time according to agenda items discussed. However, a reasonable estimate might be a percentage of time spent on Programs Committee meetings (perhaps 10 percent to 30 percent). Table 8 also shows an increase in the average amount of time the PC spent on each proposal—from .44 hours in 1972 to .73 hours in 1979.

Also to be emphasized is that item 6 in Table 8 serves only as an illustrative index of the magnitude of the Board's awards approval responsibilities. The percentage of the Foundation's annual budget over whose commitment for expenditure the Board has direct control is substantially less than the percentages shown in item 6, since item 4 incorporates funds committed over multiyear periods. Multiyear NSF awards are generally for two to three years.

A final qualification is needed for the proper interpretation of Table 8. As stipulated in the Board resolutions of 1968, 1969, 1974, and 1977 on grants and contracts mentioned earlier in this chapter, the Executive Committee has been authorized to review and approve proposals on behalf of the Programs Committee and the full Board. During the period 1972 through 1979, this occurred only on nine occasions. At three Executive Committee meetings in 1972, a total of ten proposals were reviewed and approved totaling $26.9 million. At four meetings in 1974, the Executive Committee reviewed and approved nine proposals (including two interagency agreements and one amended contract) totaling $15.8 million. And in 1975, during two Executive Committee meetings three projects and one project extension were approved totaling $3.5 million. In these instances of Executive Committee review and approval of proposals, an effort was sometimes made to solicit the opinions of Programs Committee members by telephone, particularly in emergency cases where immediate approval was necessary.[36]

Several generalizations can be drawn from table 8. The number of Programs Committee meetings per year has remained fairly constant

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[36] Interviews with former Board members and staff.

(seven to nine) over the last eight years. The number of proposals reviewed, or informed proposal reviews reported by the Committee has decreased fairly steadily since 1972. The particularly high totals for the years 1972 through 1973 are in part due to RANN project approvals involving dollar amounts which were small, but which were nevertheless considered by the Board during the initiation of that program. Even discounting this influence, there remains a decreasing trend in proposal review totals. However, the significance of this trend as an indicator of the workload of the Programs Committee is questionable because of the varied accounting methods employed by the Board and by NSF staff who submit projects to the Board for approval. An example of an NSF staff accounting of yearly proposal totals is presented later in this section. The difference between the NSF accounting procedure and that used to derive the totals in Table 8 appears to lie in the treatment of proposals grouped together to constitute a "coordinated program" for the purpose of Board approval. The NSF accounting procedure appears to count such groups as a single approval item. In Table 8, each component of a "coordinated program" is counted individually—a practice regularly followed by the Programs Committee in reporting its activities to the full Board. Since the Programs Committee and the full Board often consider and vote on individual components of a "coordinated program," the latter accounting method appears to reflect more accurately the workload of that Committee and the full Board.

NSB proposal review and approved responsibility in terms of the budgetary significance of Board-approved awards has remained fairly constant since 1972, as indicated by item 6 of Table 8. A significantly larger amount of time was spent on Programs Committee meetings during 1976–1979 than on meetings during 1972–1975.

Table 8 (item 7) shows that the Programs Committee denied its recommendation for only a small number of proposed projects—a total of 20 denials between 1972 and 1979 out of 860 proposals reviewed by the Committee during this period. Seven out of the latter 20 denials did not entail a vote of non-recommendation by the Committee. In 12 of the remaining 13 cases, the full Board voted to approve the projects in the absence of Programs Committee recommendations. Thus, for the entire period of 1972 through 1979, the Board voted only once specifically to disapprove a project although, through its approval of a revised resolution three small projects were, on one occasion, effectively disapproved. On the other hand, on 32 occasions between 1972 and 1979 the Programs Committee recommended Board approval of resolutions authorizing the support of projects which were revised in some way or which were conditioned upon the grantees' fulfillment of certain conditions specified by the Programs Committee. The number of revised or amended proposals for this period was raised to 44 by subsequent Board action, representing about five percent of the proposals approved by the Board during this period.

It has been suggested that the Board is extremely sensitive to the possibility that a Board resolution specifically disapproving a particular project might be extremely injurious to the reputation and future grant-securing success of that project's principal investigator and perhaps of others involved.[37] Such a propensity would explain the more frequent Board use of revised and conditional approvals, particularly those limiting the duration of a proposed project.

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[37] Interviews with several present and former Board members and with NSF staff.

The occasions on which the Programs Committee acted to report a proposal without recommendation to the Board or to report a modified recommendation to the Board, provide good examples of the nature of the control and/or oversight adopted by the Board over the proposal approval process at NSF. A brief description of some of these occasions follows:

> At one point in 1973, the Programs Committee was requested to recommend approval for 11 proposed projects in a new Research Management Improvement Program (RMIP). The Committee questioned in depth the structure, objectives and value of this program. With a split vote on whether or not to recommend the projects, the Committee decided to refer them to the Board without its recommendation. The Board later approved a delegation of authority to the Director to make RMIP grants not to exceed $1 million, but only after several members expressed considerable concern. The approval was made subject to the Board's receipt of special reports on such grants, and the Board Chairman instructed the Programs Committee to work with the NSF staff in developing and modifying the RMIP for fiscal year 1974.[38] One year later the RMIP was again criticized by the Programs Committee when 12 RMIP proposals came before it totaling $1,049,200. Concerns were expressed that administrative personnel at institutions conducting RMIP projects might not fully appreciate the role of the researcher and would tend to overmanage researchers and lead to wasted effort in self-diagnosis. The 12 proposals were recommended to the Board, but the Committee also recommended deferment of the application to RMIP of the general delegation of authority to the Director until the program became better established. The full Board adopted this recommendation and established a subcommittee to provide RMIP oversight through the review of RMIP proposals and grants.[39]
>
> In 1974 and 1975, the Programs Committee recommended a reduction from three-year to one-year funding for two high energy physics projects, with approval conditioned on a report to the Board on the success of the projects. The revised, conditional approvals were adopted by the Board.[40]
>
> In 1976 the Programs Committee recommended the disapproval of a particular proposal which received unfavorable peer reviews. The meeting at which this occurred was the first time Programs Committee members had access to original, unsummarized peer reviews for the proposals up for review. The Board subsequently adopted the Committee's recommendation.[41]
>
> In 1977 the Programs Committee was requested to recommend for Board approval a "coordinated program" of 48 proposals within the new Science for Citizens Program. The Committee expressed reservations about the Science for Citizens proposals and

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[38] Based on NSB/PC :16 :6 and NSB :156 :14–15, May 17, 1973.

[39] Based on NSB/PC :24, and NSB :164 :3, 9,–11, May 8, 1974.

[40] Based on NSB/PC :25 NSB :167 :12–13, NSB/PC :33, NSB :175, Oct. 16, 1975.

[41] Based on NSB/PC : 37, and 180 :10.

approved only a recommendation for a revised resolution which excluded three of the proposals originally submitted and which was contingent upon provision for the Director's discretion to reduce the number of individual awards. The Committee also requested that the Board assign a subcommittee of the Programs Committee to meet with appropriate Members of Congress regarding the methods to be employed by the Science for Citizens Program. The Board approved the Committee recommendations, thereby effectively disapproving three small individual projects.[42]

In January 1978 the Programs Committee was requested to approve the proposed guidelines for the initiation of an Experimental Program to Stimulate Competitive Research (EPSCR); the proposal did not involve a dollar amount at this point. The EPSCR initiative was in response to congressional pressures for NSF to increase the geographic distribution of its grants for scientific research. The Programs Committee voted not to recommend this proposal for Board approval, but the Board approved a modified resolution to initiate this program. In January 1979, both the Committee and the full Board approved the application to EPSCR of the Director's general delegation for an amount up to $875,000.[43]

In summary, the Programs Committee has not acted often to modify or not recommend the proposals presented to it by NSF staff, although recommended modifications have been increasingly used by the Committee since 1975. The Board most often has accepted the recommendations of the Programs Committee, but where it has not, it most often acted to approve a proposal that was not recommended by the Programs Committee.

The Board and the Director have maintained some interest in controlling the workload produced by the Board's proposal review and approval activities. An update of the earlier NSF staff analysis of NSB awards approval activities was completed by the executive secretary of the Programs Committee in January 1979.[44] The updated analysis contains a summation of Board approval items from 1969–1979 which can be broken down as shown in table 9:

TABLE 9. NSB AWARD APPROVALS BY YEAR AND SIZE

	$500,000 in 1 yr	$2,000,000 total	Total
Fiscal year:			
1969	33	8	41
1970	39	18	57
1971	42	16	58
1972	29	45	[1] 74
1973	62	16	[1] 78
1974	30	23	55
1975	18	20	38
1976	31	20	51
1977	28	33	61
1978	29	34	63
1979	[2] 28	[2] 26	54

[1] Initiation of RANN program.

[2] Revised figure after discussion with NSB staff.

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[42] Based on NSB/PC–78–2, 195:13, and NSB/PC–79–2, 203 January 17–18, 1979.

[43] Based on NSB/PC–78–2, 195:13, and NSB/PC–79–2, 203 January 17-18, 1979.

[44] Options paper on "Should the dollar level of award requiring NSB approval be raised?" Prepared by L. S. Redecke, Executive Secretary of the Programs Committee, January 16, 1979.

These totals are quite different from those presented earlier in Table 8. The same caveats regarding the interpretation of the totals presented in Table 8 apply to the totals generated from the NSF analysis and presented above. The totals presented above are probably correlated most closely with the total number of NSB resolutions approving specified awards in the years indicated. The updated staff report also includes the following list of factors influencing the workload for NSB review and approval activities:

Facts tending to *increase* number of awards requiring NSB approval or advice:

increase in NSF budget;

inflationary aspects of individual awards;

separate consideration of large awards (Materials Research Laboratories and National Centers);

new programs (primary reason for 1973 volume);

NSB approvals contingent on status reports;

repetitive items (Young Investigators, Theoretical Physics Institute, Regional Instrumentation Facilities);

NSF trend to keep NSB more fully advised by information items; and

Programs Committee informal program reviews.

Factors tending to *decrease* the awards and information items referred to the NSB:

multi-year approvals of Continuing Grants;

1977 NSB Policy Revision which clarified that new proposals or de novo peer reviews would reset [a] new level of $500,000/1 year or $2,000,000 total commitment [that must be reached before successive awards would have to be approved by the Board];[45]

the Directors Action Review Board oversight of importance of proposed items (use of alternatives, such as inclusion in Director's Report, NSB handout, brief oral report); and

increased number of NSB meetings.[46]

Among the options considered in the staff report for reducing the workload of the Board were to: (1) schedule an additional Board meeting each year (which would include a Programs Committee meeting), (2) severely limit Board consideration of other than critical information items, (3) reduce the number of Programs Committee requests for status reports, and (4) secure an amendment to Section 5(e) of the NSF Act which would allow the Board to have greater discretion in permitting the Director to make awards for NSF science activities.

Shortly after he became Board Chairman, Dr. Branscomb asked the Programs Committee to evaluate again whether its workload was a burden. The Committee decided that it was not and reported there was no need for change in the awards approval processes. Specifically it stated:

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[45] Resolution approved by the NSB at its 189th meeting of April 21–22, 1977; dated May 17, 1977 (NSB–77–245, item 2). The resolution is reprinted in section B of this chapter. Prior to this resolution, small awards (that is, less than dollar limits referred to) to a given principal investigator that were added to that investigator's original, larger award—which already had received Board review and approval. Thus, successive awards often would return again and again for Board approval even though the Board was already familiar with and in support of the project under consideration.

[46] Table 8 presented in this chapter shows that there has not been an increased number of NSB meetings. However, table 8 shows that an increased amount of time has been spent on these meetings.

Upon investigation the PC determined that its workload had not increased appreciably in the past year because of inflation or other reasons. Therefore, the PC did not recommend at this time a change in the present requirements of NSF circular No. 107 (Revision No. 2) . . . with respect to dollar amounts for proposals coming to the NSB for approval.[47]

See chapter I for a summary of major issues of potential concern dealing with the Program Committee discussed in this chapter.

2. *Program Review and Approval Activity*

Table 10 lists all of the new programs for which the Board approved the application of the Director's general authority to make awards for NSF science activities since the enactment of P.L. 90–407 in 1968. These new program authorizations were all approved by the Board upon recommendation of the Programs Committee. Most of these new programs involve applied research or science education activities, and most were initiated in response to congressional concerns.

TABLE 10.—*New Programs Approved by the National Science Board, July 1968–May 1980*[48]

- Research Applied to National Needs (RANN):
  - Intergovernmental Science (May 1970)
  - Weather Modification (October 1972)
  - Energy Research and Technology (November 1972)
  - Earthquake Engineering (Disaster and Natural Hazards) (November 1972)
  - Fire Research (November 1972)
  - Regional Science Systems (January 1973)
  - Social Data and Community Structure (February 1973)
  - Human Resources and Services (February 1973)
  - Municipal Systems, Operations, and Services (February 1973)
  - Urban Technology (February 1973)
  - Technological Opportunities (March 1973)
  - Exploration Research and Problem Assessment (March 1973)
- Student Oriented Studies (January 1971)
- Arctic Research Programs (March 1971)
- International Decade of Ocean Exploration (April 1971)
- Special Foreign Currency Program for Scientific and Technological Information (April 1971)
- College Science Improvement Program (So-called Predominantly Black Colleges) (April 1971)
- Special Foreign Currency Program for Research, Science Education and Related Activities (May 1971)
- Comprehensive Assistance to Undergraduate Science Education (CAUSE) Program (September 1975)

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[47] 220:11–12. This report on NSB covers the period from 1968 through December 1980. In February 1981, after the draft of this chapter was finished, the Programs Committee adopted a streamlined review procedure intended to shorten the time required for Programs Committee meetings. Henceforth only two or three PC members, rather than the full PC, will be responsible for in-depth review of proposed awards sent to the PC for approval. In addition, the NSF staff will no longer be required to present detailed information to the full PC on the awards packages. Based on their review of mailed, written materials and phone calls to NSF staff, the designated PC reviewers will recommend action to the full PC, which, after discussion, will then report to the full NSB. (Memorandum from Executive Secretary of the Programs Committee, NSB, on Revised Procedures—NSB Programs Committee, dated February 24, 1981.)

[48] Biennial Reviews of Delegation of Authority to the Director and/or Executive Committee for 1976, 1978, and 1980. NSB–76–165, May 19, 1976, NSB–78–217, May 11, 1978; and NSB–80–198, May 8, 1980.

Research Initiation and Support Program (October 1975)
Climate Dynamics Program (October 1975)
Pre-College Teacher Development (November 1976)
Research in Science Education (November 1976)
Weather Modification (1977 reauthorization after program transfer)
Policy Research and Analysis Program (1977 reauthorization after transfer of technology assessment program)
Science for Citizens (February 1977)
Resource Centers for Science and Engineering (November 1977)
Minority Graduate Fellowships (January 1978)
Mathematical Sciences Research Fellowship Program (November 1978, approved on a 2-year trial basis; authorization expired in November 1978)
Science and Technology Aid to the Handicapped (November 1978)
Physically Handicapped in Science (March 1979)
Research Initiation Grants, Applied Social and Behavioral Sciences (September 1979)
Appropriate Technology (January 1980)
Public Service Science Centers (January 1980)

3. Informal Program Reviews

Table 11 below lists the informal program reviews held by the Programs Committee from 1977 through August 1980. Informal reviews were held in earlier years with less frequency and under different procedures than those developed during 1977–1978.

TABLE 11.—*Programs Committee Informal Program Reviews 1977–1980*

July 1977: Chemical Processes Program/Thermodynamics and Mass Transfer Program
October 1977: Linguistics Program/Psychobiology Program/Memory and Cognitive Processes Program (BBS)
April 1978: Metabolic Biology Program/Environmental Biology Program/Population Biology and Physiology Program (BBS)
August 1978: Neurobiology Program/Human Geography and Regional Sciences Program/Economics Program (BBS)
September 1978: Low Temperature Physics Program/Ceramics Program/Polymers Program (MPE)
August 1979: Atomic, Molecular, and Plasma Physics Program (MPS)
September 1979: Water Resources, Urban and Environmental Engineering Program (EAS)
October 1979: Geophysics Program (AAEO)
November 1979: Intelligent Systems Program (MPS)
January 1980: Human Cell Biology Program (BBS)
March 1980: Anthropology Program (BBS)
May 1980: Synthetic Organic and Natural Products Chemistry Program (MPS)
August 1980: History and Philosophy of Science Program

VI. THE PLANNING AND POLICY COMMITTEE

A. General Functions

The NSB Planning and Policy Committee is one of the three NSB standing committees, the others, in January 1981, being the Programs Committee and the Committee on the Budget. The functions of the NSB Planning and Policy Committee are to:

> Consider policy issues and prepare draft documents including "white papers" on principal planning and policy issues affecting research and science education for subsequent consideration by the Board;
>
> Identify and recommend actions for the Board with regard to policies and practices affecting research and science education in the Nation with particular attention to NSF;
>
> Develop and coordinate the long-range planning meetings of the Board, and all associated documentation through interaction with NSF staff;
>
> Identify national science policy issues and national needs and consider the proper roles of the Federal Government in general and NSF in particular; and
>
> Meet with the Committee on the Budget to coordinate planning, policy, and budget processes.

These functions have not changed markedly since the committee was created in 1971, except for a deletion of some national science policy functions.

Most of the cross-cutting policy issues brought to the NSB are referred through the Planning and Policy Committee (PPC). There are exceptions—when the Director brings a policy issue straight to the Board, by-passing the PPC. Congressional and presidential requests with quick turnaround times often compel use of this route.

The PPC was created in July 1971. It is a successor to two separate committees, the Institutional Committee, and the Long-range Planning Committee. The Institutional Committee dealt with issues of institutional support and with funding-policy issues. It also nominated members to the Advisory Committee for Planning.

The PPC's policymaking activities deal primarily with policies relating to governance of the NSF and to other "policies for science", and primarily basic and applied science, issues, rather than broader national "science for policy" issues. Since the PPC is the Board's prime policy formulation unit, the Committee has been involved in NSF's policies in virtually every area, including, for instance, defining NSF's national science policy responsibilities, oversight of the Research Applied to National Needs (RANN) program, development of new funding mechanisms and programs for young investigators, and determining NSF policies regarding the support of industrial performers.

The PPC's policymaking activities often lead to the formation of subcommittees or task groups to study an issue in more detail. The result typically is the issuance of Board-adopted policy statements, numbered resolutions, and letters. Customarily the PPC is also responsible for suggesting two or three topics for annual Board reports. The PPC also has established a coherent long-range planning process for both substantive and budget-related work. It recommends for NSB approval topics for the Board's June long-range planning meetings and directs the staff who develop the background analyses done for each meeting.

Generally the more active science policy scholars on the Board have served as chairman or vice chairman of the PPC. Dr. Harvey Brooks, a noted science policy statesman, was the first chairman of the PPC; Dr. Frank Press, President Carter's Science Advisor, was the first PPC vice chairman. Dr. Lloyd Cooke, Dr. Joseph Reynolds and, more recently, Dr. William Hubbard, President of Upjohn, served as PPC chairmen. The current Chairman is Dr. Walter Massey. (For data on members, see chapter XI).

Throughout its history, the PPC has created subcommittees to conduct part of its work or, in response to long-range policy deliberations, has recommended the creation of NSB task forces or committees to report directly to the Board. The PPC Subcommittees and the dates they were created follow:

Policy Agenda Subcommittee, 1973,
Budget Management Subcommittee, 1973,
National Science Policy Subcommittee, 1973,
Ad Hoc Subcommittee on Manpower Report, 1973,
Subcommittee on Mechanisms for Improved Oversight and External Communications, 1975,
Ad Hoc Subcommittee on NSF Support of Basic Research in Industry, 1977,
International Science Activities Subcommittee, 1977,
Science and Society Subcommittee, 1978,
Coordination and Management of Applied Research Subcommittee, 1980,
NSB and National Science and Technology Issues Subcommittee, 1980, and
Science Education Subcommittee, 1980.

While the Director and staff do not overtly dominate the work of the PPC, the NSB organization and procedures have enabled the Director to influence the PPC's functions. This occurs in several ways. One is by virtue of the fact that much of the PPC's work is done by high-level NSF staff members especially close to the Director. The PPC had five executive secretaries during the period 1971 to mid-1976. All were NSF staff members, primarily from the Director's staff assistants or the Office of Planning and Resources Management (OPRM), which serves as the policy support body for the Director. Two of the three executive secretaries who served since mid-1976 have been NSB staff members who worked especially close to the Board Chairman. Since late 1980, the PPC executive secretary role has been filled by a lower-level NSF staff member.

The PPC minutes indicate that, while PPC members sometimes suggest tasks, the PPC agenda is frequently influenced by the Director—since both the Executive Committee and staff are often cited as sources for the preparation of background reports and agenda for PPC meetings, including its annual long-range planning meeting.

Subjects for PPC discussion are also suggested by external events to which the committee reacts. This is illustrated, for instance, by its actions regarding the role of the NSF Director as the President's science advisor, NSF's policy regarding geographic distribution of awards, the role of NSF in formulating national science policies, NSF's policy on disclaimers, multi-year authorizations for NSF, and NSF's policies regarding reimbursement for outsiders use of NSF-funded national research centers. There are some exceptions to this pattern.

The PPC members themselves have initiated policy studies or action leading to decisions in several notable areas. For instance, the PPC initiated action to oversee the RANN program after it had been started by the Director. It also initiated some policy-setting activities related to science infrastructure and science support mechanisms, such as statements seeking exemption for researchers from Federal regulations relating to toxic chemicals and a policy statement on DNA. The PPC occasionally has taken the initiative to enunciate policies to which the Director and staff first objected. One instance was the Board's policy decision to send verbatim peer review comments to principal investigators, a policy NSF staff opposed, but which the Board instituted in the aftermath of MACOS. Another was the PPC's and then the Board's opposition to supporting basic research in industry despite NSF wishes to the contrary, a position the Board was later forced to change. The PPC also sought to encourage staff to compile a compendium of Board policies and it formulated procedures for the Board's substantive and budgetary long-range planning exercises. A PPC long-range planning exercise caused NSF to strengthen its international science program.

These items, describing PPC activities initiated by the PPC members themselves, constitute probably about one-fourth of all the PPC's major "policy" activities, exclusive of long-range planning activities, as described below. Thus, the PPC members generally initiate about 25 percent of the PPC workload. The bulk of the PPC's activities have dealt with governance of the NSF and other "policy for science," primarily NSF-related and basic science issues, rather than by broader national "science for policy" issues, (that is, the use of science to solve social problems or to adjudicate differences in scientific fact.) The PPC's relative lack of policy initiation, and relative inattention to "science for policy" and broader national science policy issues, probably is significant only if it is agreed that the Board should have a more active role independent of the Director regarding policy discussions. It is readily obvious that shaping policy for which the Director and staff have enunciated a need may be as compelling as initiating policy. However, it can also be concluded that the PPC's policy planning activities might profit, in substance, if the Board developed a priority ranking system to select issues for its consideration. An analysis of the information in this chapter also raises the question: "Would the Board's decisions have greater impact on policymaking if the Board were to make a deliberate attempt to influence OMB's decisionmakers?"

B. OVERVIEW OF INDIVIDUAL PPC ACTIVITIES, 1971-1980

Some of the major PPC activities, exclusive of the PPC's annual long-range planning functions, subcommittee, and other activities described elsewhere in this study, are summarized in this section. The long-range planning activities of the PPC are assessed in the section which follows. The major policy statements referenced appear in appendix B.

The work of the PPC is not summarized neatly in any single report or document. The committee keeps minutes of its activities. But to trace accurately the disposition and ultimate outcome of the work of the PPC, both open and closed session Board minutes, as well as PPC minutes, have to be searched.

1. 1971

The PPC dealt with two issues in 1971, policy for the RANN program, described in chapter X, and scientific and technical manpower.

Scientific and Technical Manpower

At its first meeting, the PPC agreed to a full Board request to prepare a policy position on scientific and technical manpower, which would deal with implementation of a Federal data forecasting system and with public and private responsibilities to support scientific and technical manpower.[1]

2. 1972

During 1972, the PPC dealt with two activities described elsewhere in this report, the Research Applied to National Needs Program and S. 32, a Senate bill dealing with science policy. It also addressed the following issues:

a. *NSF-Industry Relationships.*—The full NSB asked the PPC to review a staff report on NSF-industry relationships (with programs to be administered by the new National R and D Assessment Program and the Experimental R and D Incentives Program). The PPC discussed the objectives of these two new support programs and recommended to the full Board that the PPC and the Board should keep "close control" over them.[2]

b. *Faculty Salaries.*—The PPC reviewed an NSF staff paper on the issue of faculty salaries, focusing on the uncoupling of research awards from faculty salary support. The full NSB asked the PPC to refine the guidelines contained in the staff paper for future NSB discussions.[3]

c. *Budget.*—The PPC long-range planning exercise had resulted in a statement that the NSB Chairman's testimony before the congressional authorization committees should be devoted to long-range issues while the Director's testimony should concentrate on immediate matters. The Executive Committee agreed with this proposal.[4]

3. 1973

The PPC's topics of concern during 1973 included several issues discussed elsewhere in this report: the budget, science education, S. 32, and topics for the sixth Board report. In addition the committee looked at:

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[1] PPC meeting 1, Sept. 9, 1971.
[2] PPC meeting 4 : 7.
[3] ES : 145 : 7.
[4] ES : 150 : 14.

a. *Board Reorganization.*—The PPC accepted a report of the Task Force on Board Reorganization. The report was modified to make the proposed Budget Management Committee a permanent part of the PPC. The proposed reorganization also created a PPC Policy Agenda Subcommittee and a National Science Policy Subcommittee.[5]

b. *Role of NSF Director as Science Advisor.*—A report was made to the PPC on the Director's activities as Science Advisor to the President and his plans to establish an apparatus within NSF to assist him in dealing with short- and long-range responsibilities as Science Advisor.[6] Subsequently, the PPC chairman reported on a meeting he had with several NSB members and NSF Director Stever about how the National Science Board would assist the Director as Science Advisor. According to Dr. Stever: "An important role for the Board might be to identify and define policy issues which can then be transmitted to the Science Advisor for consideration as appropriate."[7] He asked the National Science Policy Subcommittee to assess this role and the Policy Agenda Subcommittee to identify possible policy issues.[8]

c. *Annual Reports.*—In order to enhance public understanding of the need to support science, the PPC recommended and the NSB agreed that the *Science Indicators* report be issued biennially and that, in the alternate years, the Board report be "an interpretative report." The PPC also encouraged the NSB to delineate carefully the objectives and goals of Board reports.[9]

d. *Dissemination of Board Decisions, Resolutions, and Reports.*—At the recommendation of the PPC, the NSB agreed that the Board might not always reach consensus, therefore the Board should issue majority, minority, and interim reports, perhaps with different color covers.[10]

4. 1974

Several of the topics the PPC considered during 1974 are described elsewhere in this study, including topics for future Board reports, work relating to establishing a policy for disseminating Board reports and decisions, and follow-up to the June Board meeting. In addition the PPC dealt with:

a. *Funding for Foreign Research.*—NSB Chairman Handler requested the PPC to investigate the "grave situation" resulting from lack of sufficient support from public and private sources for funding stipends for postdoctoral, and research for scientists abroad.[11] Subsequently the PPC reported that this issue should be deleted, since others were more important.[12]

b. *NSB Recommendations on National Science Policy Reports by Other Groups.*—At its second meeting in February, the PPC National Science Policy Subcommittee discussed "Chemicals and Health," a report prepared by the President's Science Advisory Committee. The report contained recommendations regarding action for NSF and the Science Advisor. Upon recommendation of the Science Policy Subcommittee, the Board voted to accept the recommendations made in the report, but also stressed the need for adequate coordination among Federal agencies on future reports of this nature.[13]

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[5] PPC meeting 14.
[6] PPC meeting 15.
[7] PPC meeting 16 : 2.
[8] Idem.
[9] ES : 160 : 6–7, and PPC meeting 17.
[10] ES : 159 : 8.
[11] ES : 161 : 2.
[12] PPC meeting 24 : 8.

c. *Recommendations on NAS Report on "Materials and Man's Needs."*—At the Board Chairman's request the PPC formulated recommendations applicable to NSF from the soon to be released study *Materials and Man's Needs*, a report of the National Academy of Sciences. The Chairman was also President of the National Academy Sciences.[14]

d. *Review of Energy-related Activities.*—The Board Chairman requested the PPC to review energy-related activties. Subsequently the PPC recommended that the Board create a Programs Committee Subcommittee with responsibility for energy.[15]

e. *Proposed Meeting Between NSB and President Ford.*—The PPC discussed a proposed meeting with the President and agreed on a theme (science and the Board serving the needs of society).[16] The Board agreed to draft a "white paper" on this topic,[17] but the White House delayed for about a year in holding the meetings.[18]

f. *Office of Planning and Resources Management.*—The Director established the Office of Planning and Resources Management (OPRM) to provide staff support for the Director and for the NSB. The new Director of OPRM briefed the PPC on the missions and functions of the office.[19]

g. *Innovation Study.*—Dr. Harvey Picker, a former Board member, met with the Committee to discuss his recommendation for a Board study on innovation. The PPC, after discussing this recommendation at some length, concluded that such a report would not be appropriate for a Board annual report. In addition, a special report on this subject was discussed and the decision left unresolved.[20]

h. *NSF Science Information Policy.*—The head of the NSF Science Information Service presented the Board with information on the plans and future direction of the program. This presentation and staff-provided information from the Science Information Council called on the Board to recommend greater levels of support and asked the Board either to establish an Advisory Committee on Information, or the Director to interact with the Council on this issue. During the discussion, some PPC members asked why the Government and the NSF, in particular, should support management studies of science information services; others requested the Director to review science support activities.[21]

5. 1975

The PPC's activities during 1975 included the issues of public participation and the use of advisory groups. These issues are discussed elsewhere in this study. The other topics covered were:

a. *Reaffimation of NSF Policy Restricting Awards to Profit-making Institutions to Exceptional Cases.*—After detailed review by the PPC of NSF policies, the PPC recommended and the Board concurred that the Board should re-endorse existing NSF policy regarding scientific research project support, which restricted awards to profit-making institutions to exceptional cases as set forth in the guidelines "Grants for Scientific Research," NSF 73-12:

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[13] 162 : 7.
[14] ES : 161 : 3.
[15] NSB meeting 162.
[16] PPC meeting 21.
[17] PPC meeting 22.
[18] EC : 167 : 8.
[19] PPC : 22 and ES : 167.
[20] PPC ; 24 : 9.
[21] 168 : 7, PPC meeting 23.

> Industrial organizations are infrequent recipients of awards from the Scientific Research Project Support Program. However, in exceptional cases, unsolicited proposals for basic research will be considered from industrial organizations where (a) the project is of special concern from a national point of view and shows promise of solving an important scientific problem; (b) unique resources are available in industry for the work; or (c) the project proposed is outstandingly meritorious.

Dr. Hubbard, the next PPC chairman, said that although it might be meritorious, it would be too politically costly to permit NSF support to go to industrial researchers.[22]

b. *Basic Research in Mission Agencies.*—In connection with discussion of the NSB resolution on support of basic research in mission agencies, it was decided that the Chairman of the PPC would request a review by the Programs Committee of guidelines relating to NSF picking up projects which had been terminated by other Federal agencies.[23]

c. *Geographic Distribution.*—In its fiscal year 1976 report on the bill authorizing appropriations for the National Science Foundation, the House Committee on Science and Technology stated that it objected to the lack of reference in the NSB-prepared document *Criteria for the Selection of Research Projects by the National Science Foundation*,[24] to the statutory criterion that NSF should avoid undue geographic concentration in distributing awards. The Committee requested NSF to submit a report to show how geographic distribution was being achieved.[25] The PPC subsequently tabled examination of the need to modify the guidelines documents until the STIA Directorate could suggest ways to accomplish geographic distribution.[26] This issue was not resolved until late 1978.

d. *National Science Policy Subcommittee Given Contracting Authority.*—The PPC agreed that the National Science Policy Subcommittee should be able to commission studies and hire or contract for experts from outside NSF to provide in-depth analysis for Board use.[27]

e. *Questions of Materials Research Laboratories.*—Since NSF provides core funding for Materials Research Laboratories, the Board Chairman asked the PPC to determine if this was a special form of institutional grant. If so, should such a unique status also be accorded to other areas of research? The NSF staff presented the PPC with outlines of a research design for a study on this issue, which the PPC edited and improved.[28]

f. *Review of RANN Organization: Discussion of the Role of the Board in Reorganization Plans.*—The Budget Committee had referred to the PPC the question of studying NSF's proposed organizational arrangements, especially to determine if there were important needs that are not being met with present university capabilities, and the implications of restructuring of the RANN program. During the 24th PPC meeting, the head of the RANN program briefed the committee on changes that he anticipated. The PPC asked him to prepare a written report detailing the RANN program changes.[29] At the next executive session meeting of the Board, the PPC chairman noted lack of consultation with the Board regarding the proposed reorganization. However, he reported that "The Committee had no specific recommendations regarding this particular reorganization, but did suggest to the Director that when organizational changes of potential significance are contemplated, the plan might be brought to the Board for information before final action." [30]

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[22] PPC meeting 24 : 5 and 169 : 6.
[23] PPC meeting 24 : 3.
[24] NSB-74-300.
[25] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Science Foundation. Washington, U.S. Govt. Print. Off., 1975. (94th Congress, 1st session. House. Report No. 94-99) pp. 143-144.
[26] PPC meeting 33 : 3.
[27] PPC meeting 25.
[28] PPC meeting 30 : 2 and ES : 176 : 5.

6. 1976

During 1976 the PPC dealt with several issues including: development of a policy compendium, follow-up to the Hoff report on the relationship between the Board and the Director, and reaction to the critique of Board operations by former NSB member Roger Heyns. It also considered:

a. *NSF/Industry Relationships.*—The Senate Subcommittee on the National Science Foundation requested NSF to report by December 31 on problems and benefits which might arise from broadening NSF funding patterns to include non-academic institutions on an equal basis with other researchers.[31] The Foundation staff prepared a proposed response. After a lively discussion, the Board accepted the PPC recommendation not to accept the staff language which would equalize the competition between industry and universities, leaving the existing policy in place.[32]

b. *U.S. Antarctic Program.*—The following task was referred to the PPC by the Chairman following the September 1976 Board meeting:

> Concerning the possibility of separate authorization and appropriation for the U.S. Antarctic Research Program (USARP), the Committee recommended that USARP remain a line item in the total NSF budget but that its status be changed to a major program element. In this way the objectives of providing a clearly identified budget for USARP could for the most part be achieved without the possibility of encountering the major problems that might occur with a separate authorization and appropriation.
>
> The Board concurred; hence, there was no disagreement with this recommendation.[33]

c. *Coherent Area Grants.*—The Board Chairman referred the issue of coherent area grants to the PPC:

> The Committee discussed coherent area grants, referred from the Programs Committee following its discussion in September of a proposal from the Cowles Foundation (NSB-76-273). The Programs Committee has questioned the appropriateness of NSF making awards to loosely coordinated groups of researchers. A staff background paper distributed at the Board meeting (NSB/PPC-76-35) was discussed by the Committee.

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[29] PPC meeting : 24 : passim PPC meeting 24 : 2.
[30] ES : 179 : 30–31.
[31] Senate Report No. 94–888, May 14, 1976.
[32] 186 : 4 and PPC meeting 39 : 3.
[33] 185 : 20.

The Planning and Policy Committee recommended that the Board re-endorse its policy statement to support coherent area grants when the competence of scientists so supported is generally comparable to that of individual grantees and to develop appropriate mechanisms to ensure that quality.

d. *NSF Fellowships.*—Dr. Averch, the Assistant Director for Science Education, advised that the Directorate for Science Education will conduct a number of experimental studies to review selection procedures to avoid the possibility of bias in the award of NSF fellowships. He will report progress statements and results to the Planning and Policy Committee.[34]

e. *NSB Policy on "Dropouts".*—At the request of the Director, the PPC worked with the staff to study NSF policy on "dropouts," that is, when other agencies drop funding for a worthwhile scientific project, does NSF have to pick it up? The Director wanted NSB to develop guidelines.[35]

f. *Excepted Appointment Authority.*—The PPC proposed a resolution which the Board adopted after a slight alteration as follows:

> In order to clarify and reaffirm NSB policy, the Board unanimously revised . . . its resolution of Oct. 18, 1974, regarding excepted appointment authority to read as follows: appointments to positions which require specialized scientific, engineering, legal, or managerial training and/or experience as necessary for the discharge of the legislatively mandated responsibilities of the Foundation. All such appointments must be approved by the the Director.[36]

g. *NIH Guidelines on Recombinant DNA.*—The PPC discussed and adopted the NIH guidelines on recombinant DNA research, which the Board later adopted.[37]

h. *Geographic Distribution.*—In an effort to help the staff of STIA, which were drafting a statement on the issue of geographic distribution and possible amendment of the NSF criteria statement (in response to a congressional directive), the PPC suggested transmitting to the Director the following suggestions:

1. Restate the various institutional grants concepts,
2. Re-examine the first NSB report, *Toward a Public Policy for Graduate Education in the Science*, since it included recommendations for State and regional planning, which bear re-examination,
3. Rather than consider all proposals from the point of view of geography, consider only a certain fraction on the basis of geographic distribution,
4. Consider establishing State councils to dispense a certain proportion of funds by State (the Humanities Council was cited as an example), and
5. Revenue-sharing might be considered especially since such a mechanism has particular appeal to a substantial segment of the population.[38]

Subsequently the PPC asked OPRM to prepare a paper on alternative ways to eliminate undue geographic concentration of research support.[39] After examining the draft, the PPC stated that its philosophy was to stress "geographic distribution of high quality science, not merely distribution of funding." [40] It decided to prepare a report for Congress, among other audiences, stating that, while discrepancies exist, NSF does not have sufficient funds to ameliorate them. Congress should create specific programs that it believes will solve the problem; NSB will attempt to develop programs which might solve these problems.[41]

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[34] 185 : 20–21.
[35] ES : 183 : 3.
[36] 183 : 29.
[37] 183 : 29.
[38] PPC meeting 33 : 3.

i. *Disclaimers.*—The NSF General Counsel, at the Director's request, proposed a revised policy statement on disclaimers (as set forth in NSB–76–53.) An NSB member stated, in a letter to the Chairman, that the disclaimer statement should be expanded to cover all scientific journals and papers published in scientific journals emanating from research supported by NSF. Several Board members opposed such a requirement. A revised disclaimer statement was distributed at the meeting, but the Chairman noted that, since the issue was an administrative matter, no formal Board action was necessary.[42] However, the Chairman also referred the matter to the PPC, which made no revisions. Subsequently the Director issued a memorandum setting forth present policy and requirements.[43]

j. *NSB Member Research Support.*—The topic of modifying the NSB resolution of June 1964, which regulated the conduct of NSB members, prohibiting them from submitting applications for NSF funding, was first discussed at the PPC meeting of May 20, 1976. The PPC recommended no change in the policy. The NSB agreed to establish a group to look at the matter of NSB research support.[44]

7. 1977

During 1977, the PPC worked on several issues in addition to those discussed below. These other issues included follow-up to the Heyns statement, a briefing on ZBB, peer review, big and little science, regional forums, and planning for the 1978 Planning Environment Review (PER).

a. *Geographical Distribution.*—The PPC continued its several-year-long discussion of a staff report prepared to respond to the concerns expressed by the House Committee on Science and Technology that the NSF should avoid undue geographic concentration of research awards.[45] The paper prepared by a staff member of OPRM said basically that geographic concentration exists, but considerable new funding would be required to redress the imbalance without jeopardizing programs to productive colleges. The staff report proposed a sizable long-term institutional support program targeted at strengthening academic science departments and universities on a geographically dispersed basis. The PPC objected to the proposal for a new support program.[46]

However, at the next meeting, acting in response to additional congressional pressure, the PPC instructed the staff to identify areas of "under-developed science capacity," and develop programs to ameliorate it. The PPC stressed that ameliorative programs should be taken from an "add-on" to the budget.[47] Subsequently the PPC decided that the Director should be allowed to use "selective mechanisms" to address the problem.[48] During the November meeting the PPC reported that it had assessed two staff plans. It agreed on a formula approach for geographic distribution to States, but insisted that the funds go only to those States with greatest need to develop scientific capability, that external review be mandatory, and that awards should attract other scientists and science to the recipient State to build up scientific capability. The full NSB disagreed with the PPC's discussion, stating that it preferred to make awards only on a merit basis, and ". . . that past institutional programs which had as one of their goals providing a greater geographic distribution had not been notably successful.[49]

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[39] 185 : 19.
[40] PPC meeting 39 : 2.
[41] 186 : 12.
[42] ES :180 :3–4, 185 :25.
[43] O/D, 76–29, sent to the Board on June 2, 182 : 4.
[44] PPC meeting 35. ES : 183 : 3.
[45] House report 94–99.
[46] 187 :17.

Subsequently the Director developed the "Experimental Program to Stimulate Competitive Research," whose outlines coincide with the PPC discussion. Initially, seven States were identified as eligible for support—Arkansas, Maine, Montana, North Dakota, South Dakota, South Carolina, and West Virginia. Committees would be established to help define appropriate activities within each State; about $1 million would be spent in the fiscal year 1979, and in the next five-year period, $3 million would be spent on a select group of five from the original seven States.[50] The Board would review the proposals.[51] The first funds for five-year self-improvement programs to help researchers compete were awarded in October 1980.[52]

b. *Indirect Costs.*—Staff of the Office of General Counsel provided a background paper for discussion on the issue of indirect costs.[53] The PPC concluded that because indirect cost rates are primarily the responsibility of the General Accounting Office and the Department of Health, Education and Welfare, the NSF should not take an active position on the issue, but should be prepared to react in terms of the impact of indirect costs on the health of science.[54]

c. *Support of Basic Research in Industry.*—Modifying a long-term NSB policy, the PPC Subcommittee on NSF Support of Basic Research in Industry reported that it was politically expedient for the Foundation to support basic research in industry and that, if the NSF did not take the initiative in such plans, legislation would be passed to require it. The PPC stated that two kinds of companies might receive such funding: those which conducted research along the lines of basic research, and those which conducted research to innovate. The PPC reported that it preferred funding only the latter, on an experimental basis, for three years.[55] It also sought information from the NSF Executive Council on the history of such funding in NSF.[56]

d. *Publication of the Scientific and Personal Papers of Scientists.*—At the request of the Programs Committee, the Board Chairman asked the PPC to discuss the issue of publication. The Board "approved the policy that long-term proposals for NSF funding of the editorial development of a scientist's papers should consist of modules of five-year duration so that these can be considered independently."[57]

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[47] PPC meeting 41 : 3–4.
[48] PPC meeting 44 : 6.
[49] 194 : 13.
[50] Idem.
[51] NSF Awards Grants to Help Researchers in Five States Compete for Funds. NSF PR 80–90, Oct. 10, 1980.
[52] 201 : 12.
[53] NSB/PPC–77–7.
[54] 187 : 17.
[55] PPC meeting 45 : 5–6.
[56] 194 : 15.
[57] 192 : 11.

e. *International Science Activities.*—A 1976 long-range task force recommended that the Board and the Department of State engage in a dialogue, in part to assist the Federal Coordinating Council for Science, Engineering and Technology, in its Ad Hoc Review of Bilateral Science and Technology Agreements. The Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs met with the Board after its newly constituted PPC Subcommittee on International Science Activities drafted a set of options for NSF policies, including:

> a role as a guardian and promoter of science and technology, an "outreach" role in extending U.S. Science and Technology to other countries, a role coupled to State Department activities, improved coupling between NSF and technical mission agencies, and reporting by STIA on NSF's international activities.[58]

8. 1978

Among the activities PPC conducted in 1978—discussed elsewhere in this study—are topics for the annual report, the proposed Department of Education, big and little science, and international science. The other issues were:

a. *NSF Support of Basic Research in Industry.*—The PPC recommended and the Board adopted a resolution which liberalized NSF's position regarding support to researchers in industry. The Board stated that it agreed that a more positive statement of the Foundation's position along the following lines would be desirable:

> The NSB unanimously decided that the Foundation's policy on the support of basic research by private profit organizations should be modified as indicated by the following language which would be substantially reflected in NSF policy documents:
>
> The NSF welcomes unsolicited proposals from commercial firms. But it also wants to avoid substituting Federal support for normal commercial investment in research or compromising the vitality of research in educational institutions, where research makes a special added contribution to science education. Thus, unsolicited proposals for scientific research project support from commercial firms may be funded where: (a) the project is of special concern from a national point of view; (b) special resources are available in industry for the work; or (c) the project proposed is especially meritorious.
>
> The NSF is also particularly interested in supporting research projects that couple the research resources and perspectives of industry and universities. It therefore especially welcomes proposals for cooperative research projects involving both universities and industry.[59]

b. *Protection of Human Subjects and Rights of the Handicapped.*—The committee recommended that the NSF guidelines on the protection of human subjects as well as on the rights of the handicapped should "piggyback on" or follow those established by the Department of Health, Education, and Welfare.[60] Thus the PPC instructed NSF to follow the policy and administrative apparatus that had proven useful in other agencies.[61]

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[58] 192 : 12. PPC meeting 45 : 2–3.
[59] 195 : 16–17.
[60] 197 : 9. (NSB/Res. 78–45.)

c. *Bias in Fellowships.*—The PPC received a staff report indicating that there was no evidence for negative bias associated with either sex or race in the selection process of NSF graduate fellows.[62]

d. *Science Indicators Council.*—Dr. Hubbard, the PPC Chairman, reported that the committee considered the proposal from Dr. Derek de Solla Price of Yale University to establish a permanent Science Indicators Council. The PPC recognized that it is important to secure external reviews on the science indicator reports, but agreed that the present arrangement for informal external review is satisfactory.[63]

e. *Alan T. Waterman Award Expansion.*—The PPC considered the recommendation from the Alan T. Waterman Award Committee that NSF seek legislative authority to expand the number of annual awards from one to three. The PPC decided that the present pattern of one award each year should be retained; hence, the committee made no recommendation for change.[64]

9. 1979

During 1979, the PPC concerned itself with several issues in addition to those discussed here. They were: NSF Circular 108, funding of other agencies by NSF, the 14th Board report, peer review, and orientation for new board members. In addition the PPC focused on:

a. *NSB Support for a Two-Year Authorization for NSF.*—In anticipation of hearings testimony that the Board and Director had been asked to present on H.R. 4490, the "Research and Development Authorization Estimates Act," the Board adopted a resolution prepared by the PPC endorsing a two-year authorization, provided that adequate provisions are made for program flexibility in the second budget year. The Board reasoned that biennial authorization would provide more ability for long-range planning. Dr. Mac Lane's suggestion, that the resolution be amended to provide indexing in funding for inflation, was rejected.[65]

10. 1980

During 1980, the PPC addressed the topics of terminating regional forums, the proposed National Technology Foundation legislation, NSF philosophy, termination of the Basic Research Committee, and young investigators. It also considered:

a. *NSF as Lead Agency.*—During the 212th NSB meeting, the PPC announced that it was continuing its consideration of NSF as a lead agency in efforts involving units over which NSF has limited authority or influence, and that it might suggest this issue as a potential discussion topic at the June Board meeting.[66]

b. *NSF Circular 108.*—During 1979, the Board considered and endorsed the policies of NSF Circular no. 108, entitled "Eligibility of Other Federal Agencies and Federally-Funded Research and Development Centers for NSF Support." The Director subsequently proposed some minor changes and distributed the suggestions to the Executive Committee. The Board discussed and endorsed the changes at meeting 217 in 1980. The changes would allow NSF to continue to provide support to projects undertaken in federally funded R and D centers under certain stated "exceptional" conditions. The Board Chairman, at the same time, asked the Director to request the President's science advisor to issue appropriate reconfirmation of the Federal Government's policy that agencies fully fund Federally Funded Research and Development Centers (FFRDCs) under their jurisdiction.[67]

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[61] Idem.
[62] 195: 21.
[63] 200: 11.
[64] 200: 11.
[65] 209: 9–10. NSB/Res. 79–77.
[66] 212: 17.

c. *Policy Concerning Outside Use of Computer Facilities.*—The PPC had been assigned the task of considering policy for outside use of computer facilities at the National Center for Atmospheric Research (NCAR). It determined that the current policy of recovering costs from investigators supported by other agencies for the use of NCAR computing facilities was reasonable and should not be changed.[68]

d. *Termination of International Subcommittee.*—The PPC disbanded the International Subcommittee, but asked NSF staff to provide the PPC with a biennial report on NSF's international science activities.[69]

e. *National Science Policy.*—The PPC discussed NSB's role in national science policy issues and concluded that this was an appropriate Board function. Thus, the PPC decided to establish a subcommittee to consider mechanisms by which this can be accomplished, for example, special commissions of the Board, Board committees, or special studies and reports. The subcommittee was to report to the PPC in January 1981. The Board Chairman asked Board members to identify potential national science policy issues for the Board's consideration and requested that the Board office submit these to the PPC Chairman.[70]

C. PPC Long-Range Planning Activities

Chapter VII on the Budget Committee deals with the PPC activities related to improving the linkage between long-range planning (LRP) and budget-making. The full NSB also engages, every June, in a substantive long-range planning meeting, in which NSB task groups give in-depth attention to two or three issues which have been identified several months before jointly by the Board and NSF staff as topics warranting special attention. The PPC serves to guide planning and discussions.

Since 1976 these June planning meetings have become more formal and pre-planned in an attempt to generate policy analysis which might be helpful in preparing for budget-related resource allocation decisions. The work of the June PPC task forces is iterative. The typical practice now is for the PPC and NSF staff to start suggesting topics for discussion to the Board in January. The Board votes to choose two or three issues. (Most of the topics chosen for examination are based on Board members' suggestions, although in practice suggestions made by the Director for June LRP topics seem always to be selected.) Members also ballot to determine which task forces or discussion groups they wish to participate in. Usually NSF staff members play a major role in preparing the background documents for these meetings with staff background analysis often beginning in January and continuing over several months after the June meeting, often leading to the creation of PPC subcommittees or the adoption of an NSF resolution, and subsequent design of new procedures or programs by NSF staff.

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[67] 217: 8.
[68] 219: 7.
[69] 220: 11.
[70] 221: 11.

Many of the LRP issues discussed seem to have been reactions to external forces acting on the Board and, as such, often are of a short-range planning nature. Included among examples of this kind of planning in reaction to an event are the Board's LRP activities dealing with RANN, the appropriate mix of performers funded by the NSF, modification of peer review procedures in relation to internal review practices, as well as distribution of peer review comments to proposal writers, NSF programs for young investigators, the responsiveness of the NSF organic act in relation to the future of NSF, and NSF's reaction to the proposal to create a National Technology Foundation. Because the Board includes activities of this type in its LRP exercises, some of the LRP sessions deal fundamentally wih short-term planning issues—dealing with topics whose parameters are already defined to a large extent. Probably about one-half of the Board's LRP activities have been short-range planning activities reactive to an event or need for decision; and about one-half of the LRP activities were longer-range and anticipatory in nature. These activities are described in the next few pages. Short-range policy and planning along these lines are essential to allow the Foundation to respond quickly to changes in its funding or political environment. However, to the extent that the Board's planning activities are reactions to events, the Board is precluded from engaging in long-range anticipatory analysis which might give the Board more opportunity to shape the future of the NSF and of U.S. science policy. There is some evidence that budget-making responsibilities of NSF are aided by these deliberations and that the PPC LRP activities help to set the agenda for the subsequent PPC deliberations. However, recently the new NSB Chairman Lewis Branscomb suggested widening the scope of the Board's policy analyses to deal with broader national science policy issues as well as policy for science issues that fall outside of the limited purview of NSF. One result of his interest is reflected in the reconstitution in November 1980 of a PPC created National Science Policy Subcommittee (which had previously been created in 1973 and terminated in 1976). It is called the Subcommittee on NSB and National Science and Technology Issues.

The long-range planning issues addressed since 1971 and their disposition are:

1. 1970

Board Operation and Functions.—Before the PPC was created, the Long-range Planning Committee conducted the LRP meeting. In 1970 it dealt primarily with a paper prepared by the Director and staff, at the request of the Board Chairman, which discussed the Board operation and functions.[71] After reviewing the document, Board members agreed that "as select representatives of scientific leaders in the Nation, they should: play a more significant role in formulating national science policy; consider in greater detail long-range plans for the Foundation's budget and its allocation; seek more effective ways of familiarizing themselves with Foundation programs and policy issues; and reconsider the nature of the Board's annual report to the Congress."[72] Several procedural changes were recommended to implement this policy:

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[71] NSB-70-308 in Members Books.

preparation by the Foundation staff of a five-year projection of its budget, to allow modifications on a long-range rather than a year-by-year basis;

participation by Board members in program reviews, either alone or with advisory committee chairmen; and

development by the Programs and Institutional Committees of five-year priorities documents.[73]

2. 1971

a. *Research Applied to National Needs* (*RANN*).—The RANN program already had been established (without consulting the Board). In 1971 the Board elected to address the issue of the future role of the program and its implications for academic institutions. The PPC also suggested that guidelines be developed for awards and recommended that the Programs Committee should review all RANN awards until the program was better formulated.[74] The PPC continued to follow this issue during 1971 and 1972. (For additional details see chapter X.)

b. *Growth by Field.*—In fiscal years 1971 and 1972 NSF started to provide a larger share of Federal support of research. The Growth by Field Task Force stated that NSF's mission is changing to one of providing the underpinning of research support. In some fields this contrasts with a mission of playing a "gap filling" or "balance" role. The Board analyzed what additional mechanisms could be used to determine and forecast the additional fields and subfields where NSF support should be substantially increased in future years.[75]

c. *General Growth.*—The Task Force on General Growth reasoned that the NSF budget would have to grow significantly to achieve the goal of constituting approximately one-third of total federally supported fundamental research within the long-range planning period of fiscal years 1973 through 1977. The basic objective of NSF was to provide increasing stability to Federal support of academic research. Achievement of the goal would require a budget of between $1.1 and $1.6 billion, depending upon the increases made by other agencies. The Board studied the issue of "what programs, strategies or other measures can be identified as being most critical and effective in achieving this goal?"[76]

3. 1972

The Board issued draft statements on major topics as a result of its June long-range planning meeting. These served as background for Board consideration of S. 32, the National Science Policy and Priorities Act of 1972, and were refined to serve as background for a long-range budget discussion held in November. The Board continued to modify the statement during the year[77] and the PPC issued a statement on the legislation in 1973. Initial documents are summarized below.

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[72] ES : 133 : 2.
[73] ES : 133 : 2.
[74] ES : 137 : 3.
[75] ES : 137 : 3.
[76] Idem.
[77] ES : 150 : 4.

a. *Health of University Science; Long-Term Effect on Client "Mix" on the Foundation/University Relationship.*—The statement said basically that NSF's mission is to support basic research in universities, but that since the NSF has to secure the best research possible in each field, it should move cautiously toward a more "open door" policy regarding the kinds of institutional performers it uses. Sudden shifts in balance among performers should be avoided.[78]

b. *National Science Policy: Means To Influence Basic/Applied Program Balance.*—The statement on national science policy endorsed the idea of the Foundation and the Board assuming the initiative in public policy areas dealing with science policy and public policies which have a science and technology component.[79] On the issue of the appropriate balance between fundamental and applied research, the statement noted that, while the power to determine the balance between basic and applied research resides outside of NSF, the NSF applied research component should be below 30 percent.[80]

c. *Education, Including Public Understanding of Science; Role and Position of the Foundation Versus Other Agencies in Research Support.*—An NSB statement on education said that the Foundation had three basic roles in education: to improve the quality of professional scientists, to improve the scientific literacy of nonprofessionals, and to improve the quality of general education. This task force identified eight new kinds of science education efforts, which the NSB Ad Hoc Committee on Science Education should consider as its main charge. A basic objection to these plans was that while OMB sought innovative new efforts, it did not support sustaining grants. The task force therefore reported that OMB "may have unrealistic expectations of what science and technology can contribute to improve quality and decrease cost of education in the near term." [81]

Another statement endorsed the notion of other agencies supporting basic research and also "the planning assumptions of a redistribution of basic research funds among Government agencies, with an increase in the NSF proportion up to one-third to one-half of the total research budget." [82] Subsequently in 1974, after the next LRP meeting, the Board issued a policy resolution on basic research.

4. 1973

a. *Scientific Manpower.*—The planning group's examination of the issue of demographic and other manpower factors generated the recommendation that NSB should assume responsibility for preparing a report on scientific manpower. This led to the appointment of the Ad Hoc Committee on Manpower Report, which produced *Scientific and Technical Manpower Projections.* The NSF staff prepared the outline for this report.[83]

b. *Criteria for the Support of Research.*—After evaluating criteria for the allocation of funds among disciplines and among modes of support within each discipline, the Board revised the NSB statement

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[78] ES : 148 : 10–11.
[79] ES : 148 : 12.
[80] ES : 148 : 15–19.
[81] ES : 148 : 13–14.
[82] ES : 148 : 20.
[83] In document AD/A-OBPA (PPC : 15 : 2.)

"Criteria for the Selection of Research Projects by the NSF," (the current version is NSB-79-100). Dr. Harvey Brooks played a major role in preparing this document. The advisory committees and the General Counsel also played important roles. The document, completed in October 1974, was very restrictive regarding NSF support to industrial performers.[84]

Subsequently other changes were made to the document, including allowing industrial ressearchers to receive basic research support and ensuring geographic distribution of awards.

5. 1974

a. *Institutional Science Support.*—After discussing the establishment of three programs to promote institutional science support (university-industry work-study programs at the graduate level, scientific equipment, and targeted fellowships), a task force recommended, and the Board adopted a resolution, that the Director give priority attention in the fiscal year 1977 budget estimate to such programs.[85]

Subsequently the Board endorsed increasing the funding for equipment in the fiscal year 1976 budget. However, the Board tabled a PPC recommendation to emphasize scientific equipment purchases.[86]

b. *Basic Research in Mission Agencies.*—This NSB task force concluded that it was necessary to maintain a strong basic research component in mission agencies. The NSB adopted a policy resolution on this matter in October 1974 (NSB-78-322).[87] It also agreed to transmit the resolution to heads of departments and agencies with research programs, appropriate congressional committees, and other interested parties.[88]

c. *Future of NSF.*—The PPC long-range meeting studied the future of the NSF in relation to the following priorities: international science, science education, and support of basic research in universities. The task force concluded that the Board should give first priority to the role of NSF in supporting basic research at academic institutions.[89] This led to the appointment of an NSB Committee on the Role of NSF in Basic Research. See chapter XV.

Later, the Board approved the development by the Director of university-industry educational programs at the graduate level along the guidelines proposed at the June Board meeting,[90] even though this, Task Force had said that NSF resources were too limited to permit "opening the doors. . . ." [91]

The Board also approved the establishment of a targeted graduate fellowship program which was intended to include more women and minorities in support programs.[92]

6. 1975 [93]

a. *NSB Self-study.*—This task force looked at the overall NSB objectives, the Board relationship to NSF activities and functions, and the NSB organizational structure and practice. It recommended, and the Board agreed, that, to the extent possible, the Board's activities should be moved "away from narrower management issues" and more "towards policy concerns and increased effectiveness of its oversight responsibilities." [94] It also agreed that "The Board should undertake a more active external role on science policy issues and strengthen its linkages with external bodies, and that the Board should undertake a study of possible mechanisms to increase the efficiency of its activities. . . ." [95] To this end it was recommended that the Programs Committee undertake a detailed review of its activities to consider how it could become more involved in policy making,[96] that NSB delegate approval responsibility to the Director to the extent possible, and that the Board set up a PPC Subcommittee on Mechanisms for Improved Oversight and External Communications.

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[84] PPC :14 :2, and ES :167 :9–10 and 167 :29–38.
[85] ES : 166 : 11.
[86] ES : 165 : 8 and 168 : 5.
[87] 167 :39.
[88] 167 : 6.
[89] ES : 166 : 12.
[90] 168 : 5.
[91] PPC meeting no. 23.
[92] 168 : 5, ES : 168 : 8.
[93] The full texts of major long-range planning reports 1975–1980 are found in Appendix H.

The Subcommittee on Mechanisms for Improved Oversight and External Communications was established and later became a Committee. It eventually recommended that the Board implement its authority to hire professional staff to assist in its work. Later this practice was found to be ineffective and was terminated. (See chapter III.) Also, after considerable study of the NSF information and internal management systems,[97] the subcommittee recommended creation of an audit and oversight office and an NSB subcommittee to oversee the office in NSB. These actions took place. (See chapter XIV on the Audit and Oversight Committee.)

The PPC Subcommittee on Mechanisms for Improved Oversight and External Communications also recommended that the Foundation compile a compendium of NSB policy and procedural statements. This was not fully implemented, even though endorsed by the Board. The NSF General Counsel subsequently concluded it was difficult to put such a compendium together. As an alternative he suggested that the NSB use the NSF *Handbook for Program Managers* instead,[98] or develop a functional index, which subsequently was completed but only through 1976. (See chapter VIII.)

b. Alternative Institutional Arrangements for Basic and Applied Research.—The task force recommended that further consideration be given to the notions that growth of basic and applied research levels would be maintained best if:

i. increased NSF funds were channeled specifically into proven high performance universities through the Research University Program,[99] which would be intended, in the words of the draft task force report: "To help create, as national assets, the ten greatest science-based research universities in the world;" [100] and

ii. consideration were given to the establishment (or re-establishment) of research institutes connected with universities.[101]

The task force also considered briefly an alternative that it felt should be pursued, but not necessarily by this group, that is, that a program be designed to facilitate planning for regional university centers in various fields of science at the graduate level.[102] This activity also led to the formation of a Subcommittee on Institutional Arrangements for Research, which considered the topic of the proposed research university program.[103] The task force continued its work into the fall, discussing the issue of developing institutional arrangements for applied research.

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[94] ES :175 : 1.
[95] 175 : 24.
[96] ES : 175 : 1.
[97] ES : 177 : 9.
[98] ES 185 : 19 and PPC meeting no. 38 : 3.
[99] ES : 174 : 30.
[100] ES : 174 : 32.
[101] ES : 174 : 32.
[102] ES : 174 : 33.

c. *Adaptability of NSF Management Structure, Philosophy, and Practices to Changes in the Scientific, Political, and Organizational Environment.*—A task force dealt with management structure, including the topic of improving the peer review process. This was motivated, in part, by criticisms of the Foundation's grant award decisionmaking processes, peer review procedures, objections to supposedly "frivolous" grant titles, and criticisms of the NSF curriculum support project, "Man: A Course of Study" (MACOS).[104] After receiving considerable staff prepared information on the peer review processes used in NSF, the Task Force concluded with respect to each aspect considered.

> Confidentiality: "a higher level of responsibility and validity would result" if the peer review system were opened up,
>
> Workload: The workload of program managers would be lessened if peer review comments were made available to PIs, since program managers would no longer have to summarize comments,
>
> Selection of reviewers: there is a need to strengthen the process used to select peer reviewers, and the NSB should work towards establishment of critieria for the selection of reviewers to ensure the participation of a broader base of expertise from science insitutions in all parts of the Nation,
>
> Program officers responsibility and authority: would not change if the system were opened, since peer review is only one factor on which decisions are based.[105]

As a result of these LRP discussions, the PPC recommended that the peer review process be strengthened and opened. The Board subsequently endorsed a resolution on peer review information (NSB-75-225), intended to open up the peer review process, allowing verbatim peer reviews (with names of reviewers removed) to be sent to principal investigators even when the Foundation rejected a proposal. The task force continued its deliberations into the fall, concentrating on the selection of peer reviewers, internal audit processes, and a survey of scientific community views on confidentiality of peer reviewers.[106]

The NSF staff opposed this policy at first, on the grounds that it would compromise the integrity of the peer review process and would lead to additional work for staff. At the 178th meeting, the Board Chairman discharged the task force and appointed an Ad Hoc Committee on Peer Review Survey,[107] to follow up on this issue and to deal with questions raised by the House Committee on Science and Technology in its report of January 16, 1976. Specifically the PPC voted in favor of a policy that "Principal investigators shall be sent verbatim, unsigned copies of all peer reviews and upon request a summary of the Foundation's reasons for its decision on the proposal."[108] The staff, in subsequent discussions at the committee's November meeting, reported on the increased workload that such a change would entail. Hence, the committee reported to the Board that "100 percent automatic distribution of peer reviews to principal investigators should be a goal of the Foundation to be achieved in a timely fashion."[109] The committee also wanted award declination letters to mention the availability of these reviews. Apparently the NSF Director objected, since the motion was tabled and, in the meantime, the Director started to explore the possibility of implementing these recommedations on a small scale in a few programs.[110]

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[103] PPC meeting number 30
[104] ES : 174 : 34.
[105] ES : 174 : 34–38.
[106] ES : 176 : 5. ES : 178 : 4.
[107] ES :178 : 4

7. 1976

a. *NSB/NSF Long-Range Planning.*—Task Force 76–A on long-range planning discussed the notion of interacting more with the Budget Committee to formulate budgets and plan on a longer range basis. The Board decided that it should restructure its June meeting to review an annual planning document, originally called *Planning Environment Document*, which would generate guidelines for use in the annual Fall long-range planning estimates exercise. The document now prepared for this purpose is called *Status of Science*. The document is prepared by NSF staff. It provides NSB members with information about the status of scientific research and needs in the various disciplines that the NSF supports and it gives figures of comparable funding levels in other agencies to enable NSB to make comparisons. The inception of this activity was a major event leading toward more NSB control over the budget beginning in 1978.

Specifically, the task force on NSB/NSF Long-Range Planning recommended an annual planning environment document which would:

> involve considerable PPC collaboration with staff in preparing the document,
>
> feed into budget-making immediately since the Budget Committee should consider re-examining priority considerations based on the results of the June meeting with immediate priorities integrated into Summer and Fall budget preparation and with deferred program priorities integrated into the Fall long-range planning exercise,
>
> be reviewed by the Budget and Planning and Policy Committees immediately following the June meeting, and
>
> compel more timely scheduling of program reviews by the Programs Committee.[111]

The Board engaged in its first Planning Environmental Review (PER) in June 1977. The format of the document prepared for the PER has evolved considerably since then, but the basic objective is the same: to provide an overview of current directions and new opportunities in the individual fields of science supported by the NSF, and to compare the role of NSF to that of other public and private sponsors of research. The document currently is prepared under the direction of the Office of Planning and Resources Management, with information on each program supplied by the program manager. At times in the past the document included essays by noted science policy scholars, under contract to NSF for this task. Basically the document attempts to answer two questions: (1) Which are the important research findings within each field of science? (2) What is NSF's perception of opportunities, responsibilities and needs in each field? The current document gives information on trends in funding for science and data on NSF awards activity.[112] It includes detailed descriptions of each NSF program and program managers' ideas of special opportunities and needs within each field. Special attention is given to discussing infrastructure or support issues identified by the Board about a year before the document is prepared. The topics covered are selected from a list of suggestions received from NSB and NSF staff. The *Status of Science* document for 1980, for instance, includes analysis on the status of instrumentation, facilities, manpower, and industrial support for each program. The guidelines for preparation are included in appendix I.

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[108] PPC 43 : 3 and (NSF–77–150), 194 : 14.
[109] 194 : 14.
[110] 194 : 15.
[111] ES : 182 : 5.

The task force on long-range planning also considered the report on NSB operations prepared by the former NSF General Counsel Hoff, called the "Hoff" report,[113] and in consequence recommended that the NSF Directorates provide the PPC with a list of significant policies under which they operate, including those for which guidance is needed; that the PPC review these lists; and that "the results of these activities and NSB actions be appropriately listed and indexed in a Policy Compendium for periodic review and updating by the NSB." [114] The PPC Subcommittee on Mechanisms for Improved Oversight and External Communications also made a similar recommendation.

b. *International Science.*—Task force 76–B on international science discussed the issue of international science and if and how NSF could play a greater role in serving the foreign policy interests of the United States while maintaining domestic obligations and the NSF commitment to scientific quality. The task force recommended that NSF should seek to influence Department of State deliberations in the area and that the STIA Directorate should undertake analysis to support these activities. The topic of NSF's role in international science arose again as an LRP topic in the June 1978 meeting.

8. 1977

In February 1977 the PPC recommended that the staff concentrate on the following issues for the June Board meeting: status of science, support of basic research, and renewable resources. However, the Acting Director suggested that the topic of science and society—ethical values of science—be substituted for the topic of renewable resources.[115] The Board apparently agreed. The 1977 LRP issues were:

a. *Status of Science.*—Task Force 77–A approved the *Status of Science* report and recommended that the NSF staff prepare an annual update to the document for use in budget-making. It made specific recommendations to improve the document. It also selected several priority issues to be analyzed in separate essays in the 1978 version, including institutional issues, NSF's role in industrial basic research, NSF's role in assisting State and local governments, management of

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[112] Status of Science Reviews, 1980. Prepared by the Division of Strategic Planning and Analysis, Office of Planning and Resources Management. Nov. 1979. 378 p. (NSB 79–370.)

[113] ES : 184 : 3.

[114] 182 : 2.

[115] 187 : 18.

NSF at the $2 billion level, cross-cutting, multidisciplinary studies, and appropriate roles of NSF in international science.[116]

b. *Varieties of Decisionmaking Processes in Different Fields of Science.*—Task force 77–B dealt with the topic of patterns of decisionmaking for science. The group discussed the impending implementation of the zero-based budget system (ZBB) and developed ranking criteria for ZBB "decision units" that the directorate advisory committees and the Board should use in conducting ZBB exercises. It also recommended that the Board be given an opportunity to review the Director's proposed ZBB budget request before he submitted it to OMB.[117]

c. *Role of NSB and NSF in Interactions of Science and Society.*—Task force 77–C dealt with two topics, both inspired by legislative language. The first was the issue of the appointment of "nonscience or public" Board members. There was considerable discussion of this issue; some Board members stated that the Board should concern itself only with the appointment of high quality scientists. The Board finally adopted the task force recommendation favoring the appointment of more nonscience members. Specifically, the Board adopted a resolution that:

> The National Science Board welcomes the appointment of 'nonscience or public' members to the Board based on the following criteria: the nominees should be persons eminent and knowledgeable in public affairs, who have not been practicing scientists, but who have demonstrated involvement or interest in science and technology.[118]

The second topic related to the role of NSB and NSF in interactions of science and society. This discussion resulted eventually in reconstitution of a Committee on Science and Society to recommend improvement in NSF programs and policies to involve and inform the public in science,[119] to determine if NSF has a systematic process to determine the needs of its constituencies, and to catalogue and assess the formal and informal involvement of nonscience public groups in NSF's programs.[120] It also led to a decision that the NSB prepare an annual report on this topic.

9. 1978

a. *NSF and the Support of Research and Science Education in the 1980s.*—Task force 78–A, chaired by the PPC chairman, prepared the draft of statements on two issues: (1) defining NSF's purpose among the Federal agencies, that is as the ". . . exclusive franchise . . . within the Federal Government to foster and support research creativity and training in the Nation," and (2) defining NSF's goals for budgetary and public purposes.[121] This resulted after refinement by the staff [122] in the release in November 1978 of an NSB policy statement on "NSF and the Support of Research and Science Education in the 1980s," dated January 1979. The NSB submitted this statement to the House Committee on Science and Technology as part of NSB's deliberations regarding possible revision of the NSF organic act. It created some controversy, since, in the opinion of some critics, it overemphasized the basic research mission of NSF (to the detriment of applied research) and, according to some, by virtue of enunciating priorities for NSF, excessively duplicated the Congress' role in determining the NSF mission.[123]

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[116] 191 : 20, 21, and 193 : 27–29.
[117] 191 : 21 and Report of Task Force 77–B, 193 : 30–31.
[118] 191 : 19, Report of Task Force 77–C and Appendix D, 191 : 27.
[119] 191 : 20.
[120] 191 : 27.
[121] 199 : 14.
[122] 199 : 16.

b. *International Science/Developing Countries/Resources.*—Task force 78–B, chaired by Dr. Jewel Cobb, who was also a member of the Department of State's Advisory Committee to the Assistant Secretary for Oceans and International Environmental and Scientific Affairs, reviewed the context of NSF programs relevant to the lesser developed countries (LDCs) and found a need and desire for an expansion of effort in this area. The Task Force prepared a report which was given to the PPC.

This activity represents one of the few clear-cut initiatives taken in an LRP task force to design a program in NSF to solve a problem the Board perceived.

In her report, Dr. Cobb cited several philosophical recommendations made by the Task Force: the focus of the programs should be long-term; short-term political considerations should be avoided; the private sector should be involved and, because regional efforts may often allow a multiplier effect, they are to be preferred over single country efforts.[124] The report recommended that: NSF enlarge cooperative programs between the United States and LDCs, that NSF support programs to promote development of science infrastructure, that NSF take the lead in studies of the use of science and technology in development, and that the director of NSF seek resources to permit NSF to take a leading role in this area. A PPC subcommittee was established to oversee this topic and suggest program initiatives for international science that could be "undertaken with a relatively modest reallocation of resources," [125] to review the international responsibilities of all directorates,[126] and to deal with other international functions, such as NSF relationships with the Administration proposed Foundation for International Technological Cooperation.[127]

In November 1978, the Board adopted a resolution that NSF seek to deal with seven program functions recommended by the Subcommittee after consultation with NSF staff.[128] These were to:

expand the Scientists and Engineers in Economic Development (SEED) Program,
provide dissertation improvement grants to LDC students and establish a visiting scientists program,
encourage cooperation with LDC scientists in areas of mutual interest,
continue existing planning efforts in science education,
endorse the concept of short courses for students from less-developed countries, and
defer establishment of a program of cooperative research to aid developing countries until after coordination with the Foundation for International Technological Cooperation.[129]

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[123] See for example, U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. 1980 National Science Foundation Authorization. Hearings on H.R. 2276, February and March 1979. 96th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1979, pp. 740–741.

[124] 199 : 18.

[125] 201 : 14.

[126] Idem.

[127] 200 : 11.

[128] 199 : 18 and Report of Task Force 78–B, NSB–78–310, 199 : 24.

[129] 202 : 13, Approved by NSB Res–78–112.

c. *Planning Environment Review.*—The Planning Environment Review (PER) exercise in 1977 had resulted in considerable criticism about the PER documents as well as the utility of the planning effort.

To improve these activities, the PPC held a special meeting on February 24, 1978 at Louisiana State University in which background planning was begun for the three topics of the forthcoming June meeting. The NSF staff officials who would serve as executive secretaries for the three discussion groups explained in detail the objectives and analysis planned.[130]

The June 1978 Planning Environment Review consisted of three volumes. They all were prepared by the Office of Planning and Resources Management. Volume I was the PER Overview, intended to present important trends affecting the conduct and support of research and science education. Section 1 contained a review of NSF's funding position within the Federal Government. Section 2 consisted of six policy papers prepared by outside experts uder contractto NSF.[131] Volume II consisted of the *Status of Science* document, written by the staff to summarize important directions in individual fields of science.[132] Volume III consisted of NSB *Discussion Issues*, the working documents for the discussion begininng NSF's move into a three-year budget planning cycle.[133] These documents served as the background papers for each of the three June task force discussions.

Task force 78–C reviewed the document *Status of Science.* The Board agreed to make improvements, including incorporating a science education section, encouraging external authors who prepared papers for the document to publish them outside, and reviewing NSF procedures to consider major budget items having large open-ended commitments.[134]

10. 1979

By March 1979, the PPC determined that three documents would be prepared for the June meeting: Volume I, an updated Overview of the Environment; Volume II, the currently available *Status of Science Reviews—1979;* and Volume III, material on each of the discussion issues.[135] The PPC had directed that the PER should be revised and updated to include an "overview of last year as an annex, the new material essentially being a commentary and update with respect to new directions for change." [136]

The three topics for the 1979 LRP were:

a. *Young Investigators—Utilization and Support.*—The topic of the utilization and support of young investigators, which had been suggested by the NSB Executive Committee, occupied Task force 79–A. The task force made several recommendations regarding proposed courses of action for the support of young investigators. These were referred to the committee on the Role of NSF in Basic Research. Apparently a consensus was reached to propose a program to provide grants for individual young investigators who already have tenure-track positions (but where the funds awarded would support two investigators in the same area), rather than supporting young investigators who had not yet found employment.[137]

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[130] PPC meeting 50.
[131] 199 : 10–11. The document is NSB–78–191.
[132] NSB–78–192.
[133] 199 : 11. NSB–78–193.
[134] 199 : 16, 17. These positions are reflected in NSB/Res–78–74 and NSB/Res–78–75.
[135] 205 : 8.
[136] PPC meeting 58.
[137] 207 : 17.

Subsequently, the Head of the Office of Planning and Resources Management told the Board that such a plan would lead to training of more young investigators than necessary. The Committee on Basic Research was asked to examine the issue,[138] and proposed an alternative program—later adopted—called creativity extensions. See chapter XV.

b. *Review of NSF Organic Act.*—In April 1979, the Board established an Ad Hoc Committee on NSF Act Review to react to and plan testimony responsive to the announcement of the Subcommittee on Science, Research, and Technology of the House Committee on Science and Technology that it planned a series of studies and hearings to determine if changes were needed in the NSF organic act. The PPC also discussed this issue from time to time, especially the questions raised following the first set of hearings on the Act.[139]

This Task force also discussed the topic of review of the NSF organic act. It prepared a report which the Board received and noted, and which the Board Chairman later referred to the Ad Hoc Committee on NSF Act Review for further consideration, prior to submittal to the House Science and Technology Committee. The recommendations were:

NSB Science Policy Reports: Annual reports should be continued; a special staff group should be created to help the NSF staff write them; the Board should be less involved in the *Science Indicators* series, and no legislative changes were required.

Composition of NSB Membership: No changes were recommended; the report endorsed the June 1977 NSB statement affirming the inclusion of public members on the Board; the report noted that science faculty from four-year colleges should be kept in mind when seeking new members.

NSF Role in Federal Support of Scientific Research: The report endorsed the January 1979 statement "NSF and the Support and Science Education in the 1980s," and stated that NSF's responsibility for basic research should not be obscured by NSF's other multiple responsibilities. No changes were required.

NSF's Role in Applied Research Support, University-Industry Couplings of Research, Moving from Scientific Discovery to Dissemination: No changes were recommended, but the task force stated that better understanding is needed of the link between basic and applied research and that "Concerns seem inevitable if increases in applied research programs appear to affect basic research growth."

Increase in Board's Flexibility To Delegate to the Director: Left open at this time was the question of whether the Board should be able to delegate more authority to the Director to permit the Board more time to deal with oversight and the Programs Committee more time to deal with procedural improvements.

Continuation of Terms of NSB Members: The question of a change in the Act was left open.

NSF Position Options Concerning the Proposed Institute for Scientific and Technical Cooperation: The Board had stated an affirmative position regarding its involvement in international science activities in 1978. No change was required.

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[138] 60th PPC meeting, and CS: 208.
[139] PPC meeting, May 17, 1979.

Number of Alan T. Waterman Awards Annually: The report recommended no change with respect to the awards, but suggested changes in internal procedures, including those governing the age limit and honorable mention awards.

Number and Level of Presidentially Appointed Assistant Directors: A change was recommended to eliminate the requirements for presidential nomination and Senate approval or to increase the number of positions from four to six. The Ad Hoc Committee on NSF Act Review was asked to study the issue.

Excepted Appointment Authority: The report recommended that there be no change in the Act regarding the Director's authority to make excepted appointments.[140]

After much discussion and disagreement, the Subcommittee produced a report, which stated, in essence, that the organic act provided NSF with sufficient flexibility to carry out its charge and should not be revised.

c. *Adequacy of Funding Mechanisms.*—Task force 79–C treated the adequacy of funding mechanisms. It examined possible alternatives for funding to improve upon the NSF project grant. Topics discussed included: factors inhibiting creativity; the need to examine the evaluation of proposals without regard to track records or make awards based entirely on recent track records to insure support high risk science; overhead; continuation of the master grant concept; exploration of the block grants concept by the Committee on Big and Little Science; permitting three-to-five-year grants to cut paperwork burdens; variation in peer review practices to enhance efficiency and effectiveness; consideration of use of formula awards to institutions as an alternative to the proposed use of five-year rolling (continuing) grants, and examination of new methods to finance research equipment and to make awards to small schools. Recommendations were referred to the Ad Hoc Committee on Big and Little Science.[141] (See Chapter XVI.)

11. 1980

The PPC announced the first two topics for the June meeting and established steering groups and named staff executive secretaries at the 213th meeting in February 1980. Subsequently, in reaction to Congressional action, it chose to study a third topic.

a. *University-Industry Relationships in Science and Engineering.*—Task force 80–A prepared a report on the *Implications of Industry/University Cooperative Research*, to help guide NSF policy in this area. Among the conclusions reached in the task force report were:

i. University-industry linkages were important to NSF since they would lead to good science.

ii. NSF should be involved in such linkages, even though they already existed, since there still are barriers that hinder the establishment and functioning of university-industry research linkages. One is the different reward structures in the two settings. The other is the "intellectual property problem"—"the question of how rights to new knowledge will be distributed." The task force concluded that NSF should serve as a catalyst for developing university-industry relationships, but first should gather more information about them. It also recommended the development of certain kinds of NSF awards in support of this area : conferences, personnel exchanges, and innovation centers.

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[140] 207 : 18–21.
[141] 207 : 21–12.

The PPC requested that the staff develop plans to implement specific proposals and that the remainder of the report be referred to the Committee on the Fourteenth Board Report.

This policy discussion coincided with legislative action, since the Congress was then considering passage of a bill intended to meet many of the objectives in this task force discussion. This was the Stevenson-Wydler Technology Innovation Act of 1980, P.L. 96–480, which established programs for industrial technology to promote industrial innovation in NSF and the Department of Commerce, and gave the National Science Foundation, as well as other agencies, specific responsibilities for supporting experiments in university-industry funding for generic technology centers.[142]

b. *The Development and Maintenance of Scientific Careers.*—Task force 80–B, prompted by criticism from the Science Education Advisory Committee, discussed a background report prepared by NSF staff on "the development and maintenance of scientific careers," then prepared its own report and recommendations on the topic. (NSB–80–230.) Of the report's several recommendations, one was "that the Foundation reaffirm its priority to science education." Another recommendation was that the Board should prepare a white paper "to define the scope, depth of commitment, position, and priorities" that the Board and NSF should give to science education. The task force also recommended that NSB establish a task force on science and engineering education to prepare this white paper. It recommended that the Board communicate with "appropriate state and local educational entities to describe the Board's concerns with the present state of precollege science education," and that it collect information from scientific societies regarding educational activities of members.[143]

Subsequently the PPC appointed a Subcommittee on Science Education to, among other things, prepare the white paper.[144]

c. *Issues Associated with the Proposed National Technology Foundation.*—Task force 80–C prepared a report responding to the legislation proposed to create a National Technology Foundation—legislation which would transfer some NSF functions to the proposed new agency. The NSF Director, instead, proposed the idea of reorganizing NSF to create a separate Directorate for Engineering, which he stated would achieve the objectives of the legislation, and transfer applied research functions to the other NSF research directorates. In the task force report, certain principles were established, reaffirming that engineering research should be treated the same as other fields of basic research and that investigator-initiated applied research should be distributed among all scientific directorates.[145]

The Board viewed this exercise as part of a larger examination of the organizational philosophy of the NSF. It created a PPC subcommittee to deal with this issue and asked the Director to present a proposal to the Board, regarding strengthening NSF's science and engineering activities, for discussion at the Executive Committee meeting in July and the NSB August meeting.[146] Subsequently the Director developed an option paper to implement these proposals and examine their consequences. An NSF reorganization was announced in March 1981. (See Chapter X.)

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[142] 217 : Passim.
[143] 217 : 18, 37.
[144] 217 : 18, 36, 37.
[145] Report of Discussion Group C, Appendix C (Revised Attached to NSB–80–289), 217 : 21 and statements on principles and philosophy regarding applied science and technology, prepared separately by Dr. Branscomb, and Dr. Pettit at 217 : 22–35.

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[146] 217. 15–17.

VII. THE BOARD'S BUDGET-MAKING RESPONSIBILITIES

A. INTRODUCTION AND OVERVIEW

Prior to passage of the 1968 legislation, which revised the NSF organic act, the NSB played an important role in preparing NSF's budget. During the period 1950 through 1968, NSB and the Director jointly prepared the budget, presented it to the Bureau of the Budget (BOB, the previous name for OMB) and defended the budget before the Bureau.[1] However, from 1968 until 1976, the NSB seemed to play a secondary role to the Director in preparing the NSF budget, which had been formulated basically from the top (by the Director) down. Beginning in 1976 the NSB Committee on the Budget (COB) began to obtain control of information needed to make necessary improvements in its long-range planning and budget analysis procedures, which started in 1978. Since then the NSB seems to have begun to play a more decisive role in the formulation of NSF budgets.

Several measures may be used to evaluate the Board's actual control over the budget. One is whether it has a role as first among equals as an arbiter in Federal R and D budget-making. The Board minutes indicate that the NSB rarely discusses other agencies' budgets, either to pass judgment on them in relation to broad Federal R and D spending priorities, or in relation to determining priorities for NSF's budget. The Board does receive some information annually in its budget-related, long-range planning documents which compares NSF expenditures to similar programs and objectives funded by other agencies. And, from time to time, when discussing long-range national projects, the Board discusses other agencies' budget. But on the whole, the Board plays virtually no role in advising on science budgets or serving as an arbiter in resource allocation decisions made by other Federal agencies.

On another measure—the Board's influence on NSF's internal budget-making processes—the Board's most important function seems to be limited, mainly, to preserving the philosophy of Federal support for basic research in the natural and physical sciences, and funding for science infrastructures. Since 1978, when the Board started to shape some information flows and analysis procedures vital to short- and long-range budget-making below the Directorate level, and when it strengthened its committee organization for budgeting, the Board's budget processes have been improved to allow it to impose its will on the formulation of the budget based on priorities it has identified for funding discrete programs. Thus the Board has been able to play a more informed role in budget-making and to alter some of the Director's decisions. As a result, the budget that the Director submits to OMB is the budget formulated by the Board. However, the Board usually has finished its budget deliberations before the OMB gives the agency a "passback" budget figure in the late summer and fall.

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[1] Interview.

During this period, the Board has virtually no authority to appeal OMB decisions, little ability to change the Director's decisions made during consultations with OMB, and no influence on congressional directives in authorization and appropriations bills and reports regarding budget matters and directives to begin new programs. Congressional control, in the sense of both detailed budget-making and oversight, is ensured by the fact that the Congress requires NSF activities to be authorized annually, a provision of Public Law 90–407, the 1968 NSF amendments, and that the Congress instituted a line-item rather than lump-sum appropriation in 1968.[2]

The Board's lack of complete budgetary control may be entirely appropriate. The President and the Office of Management and Budget have primary control over budget formulation processes. Since the Director and the Board are nominated by the President and confirmed by the Senate for fixed terms, they have greater opportunity than most political appointees to play independent, representational roles. Nevertheless, the NSF is compelled to be responsive to the President and the Director of NSF necessarily has to be more responsive to the President than does the National Science Board. It is the NSF Director, Deputy Director, and staff, not the Board, who interact with the Office of Management and Budget examiners in preparing and defending the budget before OMB and after submission to the Congress.

Furthermore, budget-making is an extremely complex and cumbersome responsibility for a part-time governing board. NSF budget officers and NSB budget committee members have to deal simultaneously with three budgets. For instance by November 1979 the Board had begun its long-range planning process for the fiscal year 1982 budget, which would begin in October 1981. It was working closely with NSF staff who were defending fiscal year 1981 zero based budget exercises with OMB prior to submission of the fiscal year 1981 budget in January 1980, and it was helping to guide the Director in obligating resources allocated during the fiscal year 1980 budget cycle, following the completion of congressional budget action in the fall of 1979.

Another factor exacerbates the complexity of NSF budget-making. This is the fact that NSF's obligations for research have more than tripled (in current dollars) in the last ten years, from $289 million in fiscal year 1970 to $975 million in fiscal year 1980.

In the seventies the NSB widened its control over the budget by developing new procedures to obtain information from staff, and to link the Board's own long-range planning exercises to budget formulation activities. However, the major hurdles to NSB's assuming more budgetary control, as discussed by NSB members in interviews and as reflected in NSB minutes, were:

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[2] The Senate Committee on Appropriations, in reporting the Independent Offices and Department of Housing and Urban Development Appropriations Bill, 1969 ". . . suggests that future [NSF] budget presentations be broken down into line-items of appropriations in order to provide the committee with better information as to the varied programs of the Foundation than is gathered from an examination of one overall appropriations item." (U.S. Congress. Senate. Committee on Appropriations. Independent Offices and Department of Housing and Urban Development Appropriation Bill, 1969. Report to accompany H.R. 17923. Senate Report No. 1375, 90th Congress, second session, 1968). Subsequently the House Committee on Science and Astronautics began approving a line-item budget. The Committee reasoned that "There are numerous reasons for instituting a line-item budget for NSF at this time [1971 for the fiscal year 1972 budget]. The sheer size of the NSF budget, together with its expected increases in the future, warrant closer congressional control and overview." It also stated that the use of a line-item budget would enhance communications between NSF and the Committe and would aid the Committee's deliberations regarding making changes in specific programs. (U.S. Congress. House. Committee on Science and Astronautics. Authorizing Appropriations to the National Science Foundation. Report to accompany H.R. 7960. House Report No. 92–204, 92d Congress, 1st session, 1971. p. 63.)

The view of several NSF Directors, operating under the constraints of close control by the White House staff, that the Board should not play an important role in budget formulation;

The absence of procedures which would enable the Board to make useful suggestions for new program initiatives, due in part to the Board's own inflexibility and the absence of necessary planning information from NSF staff about special needs and actual expenditures for program areas, and about historical trends for research expressed in constant dollars;

The lack of feedback from NSF staff about whether NSB budget deliberations were useful; and

The absence of a link between long-range planning, short-range policymaking, and NSF budget-making.

The Board's attempts to gain more control over the budget have been long and arduous. For an overview, see table 12. According to Dr. Marian Koshland, current chairman of the Budget Committee, during 1979 when preparing the fiscal year 1981 budget, the Board for the first time ever, presented the Foundation with an NSB-authored statement of program priorities and estimates of expenditures needed to achieve them. Former NSB member William Hubbard, chairman of the Planning and Policy Committee for several years, said that it was not until the beginning of the 1982 budget cycle, in the fall of 1979, that NSB finally gained effective influence over budget preparation.[3] This is a distinct change from previous practice where the Board did little more than react to figures presented by NSF staff, or estimated future expenditures on the basis of a fixed percentage increase.

TABLE 12.—EVOLUTION OF THE BUDGET COMMITTEE AND OF SIGNIFICANT EVENTS IN ITS RELATIONSHIP TO THE STRUCTURE OF MAJOR COMMITTEES AND THE STATUS OF LONG RANGE PLANNING, 1968–80

Date	Committee structure			Long-range planning/ budget event of significance
	Statutory	Standing	Task	
October 1968	Executive Committee.	Budget Committee (same membership as Executive Committee). Programs Committee. Institutional Committee. Long-Range Planning Committee.		
December 1970	do	do		NSB decided to require the Director to provide a 5-yr plan every March, for consideration at an annual March long-range planning meeting. NSB members asked to submit suggestions for new programs to Director, with copy to go to NSB chairman.
May 1971	do	Budget Committee (same membership as Executive Committee. Planning and Policy Committee (replaced Long-Range Planning Committee). Programs Committee.		
June 1971	do	do		PPC June meeting discussed 3 budget related LRP issues for the first time.

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[3] Interview with Dr. William Hubbard.

TABLE 12.—EVOLUTION OF THE BUDGET COMMITTEE AND OF SIGNIFICANT EVENTS IN ITS RELATIONSHIP TO THE STRUCTURE OF MAJOR COMMITTEES AND THE STATUS OF LONG RANGE PLANNING, 1968–80—Con.

Date	Committee structure			Long-range planning/ budget event of significance
	Statutory	Standing	Task	
June 1972	Executive Committee.	Programs Committee		NSB, at the June long-range planning meeting, asked NSF staff for comparative data re: Federal funding by agency for science, by discipline. For the first time, ADS gave a presentation on future plans for their directorates. NSB starts a procedure at June meeting of dividing into task forces to consider science policy and infrastructure issues relating to resource allocation decisions.
October 1973	do	Planning and Policy Committee. Budget Management Subcommittee. Programs Committee.		The subcommittee was created as part of the PPC; control moves away from Director.
1974	do	do		Budget Management Subcommittee makes a concerted effort to use NSB-suggested opportunities when discussing fiscal year 1976 budget plans with staff.
September 1974	do	Planning and Policy Committee. Programs Committee.	Budget Committee (created as a task committee).	Creation of a COB. The COB, with considerable assistance from NSF staff, prepared the first written budget report for use at the January 1975 meeting, dealing with the fiscal year 1977 budget. It incorporated suggestions made by NSB after hearing a staff presentation on long-range planning.
1975	do	do	do	COB develops new procedures to permit earlier and better impact on budget-making. COB provided a preliminary written report to the Board in December. After NSB comments were received, the COB produced a refined report in January which was discussed at the February meeting. At the February meeting the NSB Committee of the Whole voted to accept the report which led, it said to the first NSF budget request at a realistic level, with additional priority add-ons.
June 1976	do	do	do	When preparing for the fiscal year 1979 budget, COB, for the first time, requested from NSF detailed projections and analyses of how resource allocation decisions were made. PPC established a planning environment review (PER) process, first used at the June 1977 meeting. It was intended to give NSB information re: scientific priorities and an indication of the relationship of NSF programs to other federally supported efforts. It was also intended to provide background for fall long-range planning meetings.

TABLE 12.—EVOLUTION OF THE BUDGET COMMITTEE AND OF SIGNIFICANT EVENTS IN ITS RELATIONSHIP TO THE STRUCTURE OF MAJOR COMMITTEES AND THE STATUS OF LONG RANGE PLANNING, 1968–80—Continued

Date	Committee structure			Long-range planning/ budget event of significance
	Statutory	Standing	Task	
1978	Executive Committee.	Programs Committee.	do	New NSB Budget Committee chairman initiated new information control procedures to obtain views from Assistant Directors on science needs and budget needs. AD's briefed full NSB recreation of cross-directorate programs.
February 1979	do	do	do	For the first time, the full NSB divided into groups to hear presentations of AD's re: long-range plans, in preparation for preparing a written COB report for the Board to use in preparing a budget for fiscal year 1981. New NSB chairman made the COB a standing committee because of the importance of its tasks.
May 1980	do	Planning and Policy Committee. Programs Committee. Budget Committee.		

Source: Compiled by the Congressional Research Service based on NSB minutes and documents.

The Board's enhanced ability to shape NSF budgets also has enabled it to make decisions that the Director might not want to make publicly on controversial resource allocation issues dealing with two or more directorates. Also, insofar as there is consistency in its recommendations over time, the Board's annually enunciated priority choices—such as for funding research equipment and for social sciences—carry added weight.

B. 1969–1973: LIMITED NSB CONTROL OVER THE BUDGET

1. *NSF Director Controlled the Budget Committee Via Chairmanship of the NSB Executive Committee*

During the early period, 1969 through 1973, the Directors' domination of the budget-making process was caused in part by the personalities and independent styles of the incumbent Directors (McElroy and Stever) and reinforced by the procedures and committee apparatus the NSB had established to deal with budget matters. The 1968 legislation prescribed an NSB Executive Committee, composed of the Chairman and Vice Chairman of the Board, two other Board members elected biennially, and the Director, who chaired the Executive Committee. The Ad Hoc Committee on Board Operations, in September 1968, recommended that the Board create a standing budget committee, whose membership should consist of members of the Executive Committee, which was chaired and virtually controlled by the Director. The Board Chairman, however, was named the Chairman of the Budget Committee.[4]

It is acknowledged generally that the Budget Committee, during the period 1970 to 1973, played basically the role of reacting, within a very short-time frame, to decisions made by the Director and staff.

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[4] 120 : 13.

For instance, the following excerpts from a discussion of the fiscal year 1971 budget illustrate the primacy of the Director's role and the Board's felt inadequacy:

> The Director called the Board's attention to several major changes and trends in the . . . 1971 budget. It has been restructured to emphasize the Foundation's "new thrust"—i.e., the support of . . . activities which might assist in the solution of societal problems, particularly through interdisciplinary activities [to be funded at $13 million]. . . . The BOB has recommended the reduction of high school teacher institutes from $36.5 to $20 million. . . . Early in the negotiations for the . . . budget, BOB decided that no Federal funds could be requested . . . for new graduate traineeships [which are to be replaced by loan programs]. . . . The Board expressed grave concern over the Bureau's decision to terminate . . . the Graduate Traineeship Program and decided to transmit its views in a letter to the President.
>
> . . . The Chairman requested the Director to provide the Board with a Memorandum containing detailed information regarding the fiscal year 1971 budget, including the rationale which led to the major reductions and increases in the various programs.[5]

The Board Chairman made a similar request for the NSF Director and staff to give the Board more and better information in order to enable the Board to assist in preparing other budgets during this period.[6]

2. Deliberations About Making the NSB More Active in Budget-making

During the fall and winter of 1970 the Board's Long-Range Planning Committee considered how NSB could become more effective in formulating national science policy and in making more meaningful inputs into the budget process. The committee proposed and the full Board agreed that:

> the March Board meeting every year should be devoted to the consideration of long-range budgetary planning. The Director will bring to this meeting a five-year projection with major issues highlighted, including recommendations for Board action, and
>
> Board members with specific items to contribute regarding the budget should submit them to the Director with a copy of the proposal to the NSB Chairman.[7]

This last proposal, that Board members make suggestions regarding budget items without knowledge of program managers' goals, state-of-the-art development, or financial trend data—a reactive, highly segmented way of acting on budget proposals—persisted as the typical Board budget-making procedure until the new practice was begun in 1976.

3. 1971 Long-Range Planning Meeting

In March 1971, the Director gave the Board the first long-range planning document prepared by the staff pursuant to these procedures. The document contained four parts:

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[5] ES : 129 : 6–7.

[6] For instance, several pages of minutes of the Executive Committee meeting 70–2 were devoted to a discussion by the Director and staff of preliminary plans for the Foundation's budget for fiscal year 1972, of the staff's view of projects which needed special funding and of the staff's first estimates of a five-year plan through 1975. This was followed by the statement that "The Board Chairman urged the Director to provide the Board with a document containing details on the . . . 1972 budget estimates as soon as they have been adequately formulated by the staff." (ES : 132 : 6 and ES : 132 : 10.)

[7] ES : 134 : 4–8.

1. The planning environment, a summation of the Federal environment and major factors which, in the view of the staff, were critical to the Foundation's budget;
2. A discussion of 12 planning issues, identified by the staff, which required the Board's action or views;
3. A first cut of program plan highlights, covering the period 1973 to 1977; and
4. A presentation of the staff's estimates of financial estimates through fiscal year 1977.[8]

Under the auspices of its Planning and Policy Committee, the Board in 1971 had instituted an annual long-range planning meeting, held each June, in which science policy issues of a broad scope—but not NSF budget issues—were discussed. According to the minutes, the Board decided to devote more time at its 1971 June meeting to three of the 12 planning issues, all of which were oriented to budget topics. (See Chapter VI, above.)

In the typical pattern that would persist for several years, the Director summarized the sense of the NSB budget discussion priorities, which, he said, he would "take under advisement. . . ."

4. Expansion but Continued Restraint in the Budget Committee's Role

A Board reorganization took place in May 1971, during which time several committees were abolished and were replaced by two new standing committees. At that time the Board also decided that the existing Budget Committee could fulfill the role of the third proposed standing committee.[9] The reorganization expanded the Budget Committee's role, from its primary function of advising on budget and fiscal matters and having special responsibility during the early phases of the budget cycle, to include a liaison and promotion function with OMB and the Congress.[10]

Despite the reorganization, budget-making practices for the fiscal year 1973 budget continued to be controlled by the Director as before. The typical procedure used in a budget-making cycle began with the Director and staff preparing and presenting to the OMB, and then to the full Board, estimates of proposed budget expenditures in each program area at three different total target levels.[11]

In what has subsequently been called a "haphazard procedure," Board members continued to be urged to submit suggestions for new initiatives to the Director and the Board Chairman. However, they were given virtually no systematically accumulated information about current expenditures or program needs. Nor did they participate with the Director in developing preliminary budget estimates.[12]

Preparations for the fiscal year 1974 budget continued according to the same procedure. The OMB and the Director clearly were the major players in the NSF's budget-making process. For instance, in March 1972, the Board received a briefing on Federal R and D programs and budget from Dr. Edward E. David, the President's Science Advisor. He summarized the references that the President made in his March 16, 1972 budget message on R and D, noting the importance that the President wanted to give to using the Foundation's support programs in science and technology to help solve social problems. But, apparently, the Science Advisor did not solicit the Board's suggestions in this area, although Dr. David did ask for the Board's suggestions regarding the strength of institutions of higher education.[13] In addition, during this meeting the Director reported to the Board on details of discussions that he had with OMB Director George Shultz and other OMB officials regarding their plans for NSF. OMB considered the proposed ten percent increase in fundamental research in the NSF budget as large, OMB was concerned about the Foundation's programs in direct support of education, and "OMB [was] emphasizing its management role to a greater degree than before." [14]

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[8] ES : 137 : 2.
[9] 138 : 18.
[10] 140 : 11, Mtg. July 15–16, 1971.
[11] ES : 140 : 2.
[12] ES : 142.

5. *The Board Attempts To Strengthen Its Budgetmaking Role, 1972–1973*

a. 1972

In June 1972 during the fiscal year 1974 budget discussion, the Board began to express concern about the need to interact with the Director at an earlier stage in shaping the budget, not only to exercise its authority, but also to assist him in defending the request before Congress and the Administration.[15] At that same meeting the Board took another step toward obtaining more control over the budget when it requested the Director and staff to provide comparative information for the June meeting about expenditures, that is, "Federal support of research at educational institutions in earth sciences, mathematics, astronomy, and if possible, biology and chemistry. . . ." [16] The 1972 June long-range planning meeting (for 1974) was notable also for two other milestones in the evolution of the NSF budget process. For the first time the meeting included a presentation by Assistant Directors of general long-range plans for their directorates.[17] Also the Board made a decision to integrate, insofar as possible, the budget formulation process and its discussion of long-range substantive issues. Therefore, the meeting also included separate discussions by three NSB task forces of six substantive long-range planning issues which the staff decided were relevant to all Foundation programs. Each of the three task forces developed preliminary statements on the issues during the June meetings and they were subsequently referred to the Planning and Policy Committee for refinement and follow-up discussions [18] at the November meeting, in an attempt to generate consensus among Board members so that the documents could serve as the basis for the Chairman's testimony before the authorization committees that spring.[19]

The Board also expressed considerable interest in interacting with NSF staff earlier in the budget process and discussed several alternative ways to do this—but at the strategic rather than the tactical level. But "it was agreed that the Board concern iself with the major issues—priorities, distribution among fields, areas needing emphasis, new programs, etc.—and not involve itself in tactical negotiations, e.g., trade-offs." [20]

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[13] ES: 145: 8–11.
[14] ES: 145: 6, 14–15.
[15] ES: 147: 7.
[16] ES: 147: 8.
[17] ES: 148: 2.
[18] ES: 148: 3.
[19] ES: 150: 4.

In response to these concerns, the Director proposed to provide the Board at the November meeting with a schedule of the budget review process to identify key times at which Board guidance might be useful in advising on policy and "discipline emphases." [21] At the November 1972 meeting, the Director stressed that the Board's guidance probably would be most relevant at the "early planning stages of a budget . . ." since major budget decisions later tend to be made on short notice.[22] NSF Assistant Director Dr. Edward C. Creutz suggested four specific ways in which the Board could be more effective in the budget-making process. But none of these identified a decisive role for the NSB in the budget formulation processes. They were:

Individual Board Members could keep the Foundation currently informed of important trends in their fields.

The Board as a group could discuss competition among disciplines.

The Board could help the staff frame arguments for the importance of science.

The Board could provide guidance on issues concerning the interacting roles of the various directorates; e.g., Research and Research Applications, Research and National and International Programs.[23]

b. 1973

In 1973, at the beginning of the fiscal year 1975 budget cycle, the Board took several more steps to strengthen its role in budget-making by broadening the quantity and quality of information available to it.[24]

The Director had presented his preliminary budget and long-range plans to the Board early in the spring, as was customary. However, the Board stated that it had not received sufficient budget-related information from the Director, and asked him to respond in writing to certain questions and suggestions that the Board made at the April meeting. These responses were presented to the Board in May, "Staff Responses to NSB Policy Questions," (NSB-73-151). But because of time pressures, the Director already had presented a proposed 1975 budget to OMB based on the preliminary discussions held in March and April.[25]

During April 1973, the Planning and Policy Committee also discussed how the Board might participate more fully in the fiscal year 1976 budget cycle. The PPC also wanted to widen the Board's impact on budget making to include more interaction with the OMB when NSF was defending its budget.[26] Task Force II of the June 1973 LRP meeting recommended "that the Board should devote a meeting to playing 'a game' of allocating a given sum among the various disciplines, listed in the cross-walk table [that had been distributed]." Further, it was recommended that the NSB should use several alternative budget levels and should interact with staff using different kinds of criteria for support of science.[27]

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[20] ES : 150 : 5.
[21] ES : 150 : 5.
[22] ES : 151 : 5.
[23] ES : 151 : 5.
[24] ES : 155 : 12.
[25] ES : 156 : 5.
[26] ES :157 :11.
[27] ES : 157 : 23-24.

C. 1973: TOWARD MORE INDEPENDENCE IN BUDGETMAKING: CREATION OF A BUDGET MANAGEMENT SUBCOMMITTEE AS PART OF THE PPC

The Ad Hoc Committee on Board Organization recommended to the Board in September 1973 that it abolish the Budget Committee that had been composed of the Executive Committee since 1968, on the grounds that it ". . . had had a limited scope and has not been active during the past several years." [28] In its place, it recommended creation of a ". . . Budget Management Subcommittee as part of the PPC.[29]

The Budget Management Subcommittee was chaired by Dr. Grover Murray. It turned out to be a prototypical precursor of the Budget Committee which was established the next year, and which was also chaired by Dr. Murray. At its initial organizing meeting in October, the Subcommittee adopted what appeared to be a more active role than that of its predecessor. It was to

> Assist in the planning/budgeting process by serving as a liaison between the board and the staff in the development of major issues for discussion and in the resolution of any immediate issues associated with budget planning, and further to design and establish board procedures for interacting with the staff on budgetary issues.[30]

At its first meeting in October 1973 the Subcommittee also asked the Board and staff to submit suggestions for "research opportunities" for consideration in the 1976 budget estimates. But more importantly, perhaps, for the first time it asked NSF staff ". . . to develop bar charts showing NSF budget levels by major activity over the past ten years. . . ."

During its next two meetings the Subcommittee continued to discuss its role and how it could make a more meaningful and earlier input to the budget. It debated whether it should accept the Director's estimates as presented and authorize their transmission to OMB, or whether it should study the estimates and provide comments and guidance to the Board for extended discussion in April with deferral of long-range issues to June.[31] Apparently the Subcommittee played an active role in discussing budget plans with the staff and in having staff incorporate NSB suggestions into the fiscal year 1976 budget, which the Board approved in April for transmittal to OMB.

D. SEPTEMBER 1974: CREATION OF AN INDEPENDENT COMMITTEE ON THE BUDGET AS A FOCAL POINT FOR NSB BUDGET DISCUSSIONS AND PREPARATION OF WRITTEN BUDGET REPORTS

In September 1974, in the typical pattern of soliciting Board suggestions of "opportunities," the Subcommittee started discussing suggestions received for the fiscal year 1977 budget and made plans for NSF staff to develop program estimates to be presented to the Board the following March.[32] But a change in NSB membership and leadership which occurred that month led to a change in Committee organization. On September 20, 1974 NSF Director Stever swore in seven new Board members. Also Dr. Norman Hackerman, upon becoming the Chairman of the Board in September 1974, announced a revision of the committee structure. The Budget Management Subcommittee of the PPC was terminated and in its place was created a Committee on the Budget (COB).

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[28] Report of Ad Hoc Committee on Board Organization (Revised), Sept. 21, 1973. p. 6.
[29] Ibid., pp. 6–7.
[30] ES: 159: 10.
[31] ES: 163: 6.
[32] ES: 166: 14 and ES: 166: 15.

1. *Functions*

This Committee was to remain a task committee until 1980, when the new Chairman of the Board, Dr. Lewis Branscomb, made it a standing committee because of the continuing importance of its functions. The functions of the Budget Committee remained about the same during the six-year period 1974–1980, although in later years the Board's responsibility to interact with the OMB and Congress was made more explicit. The current charge is to:

1. Provide a focal point for Board participation in budgetary matters, including program priorities.
2. Provide advice to the Board and Chairman on NSF budgetary issues [Changed in 1978 to "on NSF authorization and appropriations issues."]
3. Help serve as spokesmen for Board on NSF budgetary matters. [Added in 1978: "with the Office of Management and Budget."]
4. Reexamine priority considerations, based on the results of the June Board meeting, with immediate priorities integrated into summer and fall budget preparation and deferred program priorities integrated into fall preparation of long-range planning estimates.
5. Meet with the Planning and Policy Committee during the June Board meeting to review results of Board discussion of and actions/guidelines on PER.[33] ["For long-range planning meetings," added in 1978]

2. *Evolution of Activities*

The Committee on the Budget established two new procedures. First, it began the annual budget preparation process earlier than did its predecessors. Second, it began a series of analyses resulting in a written report which was intended to guide the NSF staff in preparing a budget for presentation to the full Board. At its second meeting in November, the Committee, after receiving a preliminary presentation by the staff, urged NSB members to review the proposed plan and to submit any additional suggestions. As a result of the presentation, the Chairman designated certain issues for additional study by the PPC before the Board would recommend additional budget action on them: a review of the RANN program and an evaluation of the capability of traditional institutional arrangements to meet the current research needs.[34]

a. First COB Written Report, 1975.—On January 15, 1975, the COB presented a written report to the full Board on the fiscal year 1977 budget. According to the minutes, although most of the report was written by NSF staff members assigned to work with the Committee,[35] this was the first detailed document submitted by a budget committee to the full Board containing "considered judgments and recommendations of significant issues requiring the Board's decision at an early stage in the development of budget estimates and plans for the next fiscal year."[36] The Board minutes note that the report, entitled, "FY 1977 Program Thrusts,"[37] ". . . resulted from an extensive interchange between Board Members and staff over the past eight months. Seventy-six major program and project proposals, submitted by the Board Members and the staff, had been reviewed by the Committee. The Committee then developed a report containing the Committee's recommendations on these proposals for program initiatives and areas of emphasis in fiscal year 1977."[38]

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[33] NSB Committee Structure and Membership, December 29, 1976. NSB–76–454.

[34] ES : 168 : 10–11.

On February 21, 1975, upon recommendation of the Committee on the Budget, the Board held a special one-day meeting, as a committee of the whole, to consider the fiscal year 1977 budget estimates and program plans prior to final action by the staff for submission to OMB.[39] The Committee voted to accept the report at the February meeting.[40] The staff, following the recommendations in the report, had developed a preliminary budget and program, which according to Board minutes was ". . . within a realistic total dollar figure, including a separate list of possibly high priority add-ons for each budget activity."[41]

The COB Chairman presented this document, entitled "Fiscal Year 1977 Preliminary Plans and Estimates" (NSB–75–53), at the February meeting. He said that the staff would follow the guidance provided in the document in making their presentations of issues requiring resolution to the Board. The Director observed that the Board had made a major contribution to the formulation of the Foundation's programs and budget for fiscal year 1977, but that staff might have to make changes as the negotiations proceeded with OMB. The Board proposed a target of $850 million, with staff submissions totaling $890 million. The staff subsequently agreed on a request of $875.3 million. According to the minutes, "The Director elicited the Board's specific guidance about recommending to OMB the additional funding of the . . . add-on projects totaling $64.5 million. Dr. Murray noted that this is the first time an NSF budget has been developed at a realistic target level in the beginning with priority items above this budget target listed separately."[42]

The Committee on the Budget in March 1975 took an active role in following through the fiscal year 1976 budget and preparing the fiscal year 1977 budget. It reviewed two items which had been suggested in the research directorates subsequent to the presentation of the budget: accelerator technology and picking up materials research projects dropped by the Advanced Research Projects Agency of the Department of Defense. It reported that it also reviewed the add-on items of the Assistant Directors, and recommended the particulars of the fiscal year 1977 budget that the Director should submit, which the Board subsequently approved.[43] NSB members at this meeting discussed the budget in detail and offered specific comments on programs, such as the statement by Dr. Thieme:

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[35] Mr. S. McNinch, Jr., and Dr. E. Creutz.
[36] ES : 169 . 13
[37] NSB–75–15.
[38] ES : 170 : 1.
[39] ES : 168 : 10–11.
[40] ES : 170 : 1.
[41] ES : 170 : 2.
[42] ES : 170 : 3.
[43] ES : 172 : 9.

> I have grave doubts about NSF embarking on a program of economic analysis. . . . I am not content with the judgment which excluded the social science development program which I suggested. . . . a place in the budget should be reserved for meeting the challenges with a strategy which we must devise.[44]

E. Continued Criticism of NSB Superficiality in Budget Matters, 1975–1976

Despite the improvements which had been made in Board participation in budget-making, at the September 1975 meeting of the COB serious concerns were raised about the superficiality of NSB participation in the budget:

> Several Members indicated a serious concern over the somewhat superficial manner in which the Board participates in the budget development exercise. Specifically, it would be highly desirable for the Committee on the Budget to monitor the development of estimates more closely for the Board and to participate in making decisions on priorities and a strategy for inclusion in the final budget request of highly promising new initiatives and emerging problems. Such consideration by the Committee on the Budget and later by the Board, was considered especially desirable since several of the add-on items were new to the Board and certain other activities previously discussed were excluded.[45]

Subsequently the COB reported that, when the staff initially prepared estimates for 1978, Assistant Directors used their own set of growth assumptions and, as a result, the estimates varied considerably, resulting in a marked imbalance among program areas. OMB made changes to budgets already approved by the Board, further compromising the long-range planning efforts and plans made by the Board. As a result, new mechanisms for long-range planning seemed necessary in order to improve budget-making and to avoid ". . . simply dividing up the resources."[46]

During the spring of 1976, COB members continued to explore ways to improve the influence of the COB and the NSB on NSF budget-making. The Board said that it had insufficient time to react to cutbacks made by OMB after NSF presented the budget and that it was concerned about the eventual distribution of funds and possible duplication between agencies in funding basic research. Therefore, a suggestion was made that staff give the COB a set of program priorities at the June meeting of the Board which would be considered for elimination based on reduced levels that OMB was expected to report back.[47] Others apparently felt that the COB needed more lead-time to develop its posture on program priorities in any given year and, therefore, asked the staff to prepare a schedule to permit a more systematic approach for preparation of the fiscal year 1979 budget with sufficient lead-time so that the NSB would be able to react to OMB budget directions.[48]

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[44] COB meeting No. 5, March 20, 1975.

[45] ES : 175 : 6.

[46] ES : 178 : 8.

[47] COB meeting No. 15, Mar. 17, 1976.

Other COB members expressed concern about their need to obtain information to establish priorities below the directorate level. In response, the staff agreed to provide bimonthly, summarized reports on budgetary developments.[49] At the same meeting, Dr. Murray proposed, to COB, development of a biweekly newsletter to COB to include information on budget-making activities.[50]

However, the COB apparently continued to feel that it had to become involved earlier in budget-making; therefore, in July 1976 it sent a letter to the NSF Director requesting that he provide the following information:

> Two- to three-year projections of commitments for programs,
>
> Analyses of how each directorate reaches the dollar figures included in estimates (Dr. Rice said that the amounts that staff used in the long-range planning document were "blue sky" and that more realistic estimates should be made to avoid wasting staff and Board time), and
>
> A listing and summary discussion of alternative levels of financing and alternative allocations for funding.[51]

When preparing the fiscal year 1979 budget, the Board continued to use the same procedures as before. The COB held "mini-hearings" with presentations from the Assistant Directors, considered suggestions made by NSB members, and presented the NSB with a preliminary budget report in December. In January and February the Board considered the material and then adopted a report to guide the staff. Suggestions for budget allocations were "strategic"—at the directorate level—rather than "tactical," that is, priorities within programs.[52]

Board members continued to complain about their perceived lack of impact on the budgetary process. For instance, in October 1976, Dr. Anna J. Harrison, from her vantage point as Chairman of the Programs Committee, wrote to the Chairman of the Budget Committee about her felt lack of impact on budget-making:

> I have not managed to discover how to contribute to the deliberations of the Committee. There is limited direct feedback. It is difficult to respond for year Y when I do not know the actions being taken within NSF for year (Y–1) budget. In fact, I do not even know if communications to the Committee are received by the Committee.[53]

According to the minutes of the Budget Committee, the Chairman responded that ". . . although he sympathized with Dr. Harrison's problem, . . . there are many times Board input into the actual budget process is virtually impossible. The prime example occurred recently in preparing a fiscal year 1979 budget in less than a week, at the Office of Management and Budget direction. He indicated that every effort should be made to bring the NSB into the deliberations process of the Committee on the Budget as soon as possible . . ."[54]

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[48] COB meeting No. 15, Mar. 17, 1976.
[49] ES : 181 : 17.
[50] COB, 17th meeting, June 22, 1976.
[51] COB, 18th meeting, June 20, 1976.
[52] ES : 187 : 4.
[53] Letter dated Oct. 11, 1976.

In addition, some Board members objected to the Board giving total responsibility to the Director or the Executive Committee to make final decisions regarding the budget during the summer months when the full Board did not meet. Some Board members were unhappy that the Board did usually not learn of the President's and Science Advisor's views about budgetary preferences until the summer months, after the Board had completed most of its budget deliberations.[55] Suggestions were made to invite OMB and OSTP officials to brief the Board earlier in the budget deliberation process.

F. ESTABLISHMENT OF THE PLANNING ENVIRONMENT REVIEW, 1976

Another innovation intended to enhance NSB control of the budget was made in 1976, with the establishment of the Planning Environment Review process. This process is to focus on long-range issues which are not directly coupled to the next budget cycle, but which are important to the scientific community and which likely would feed into the long-range planning budget meeting. (For additional details see chapter VI.)

The document prepared through this process is specifically for Board use and it is limited to internal administrative distribution. In recent hearings on long-range planning before the House Committee on Science and Technology, Congressman Brown raised the question of widening the distribution of the documents (apparently it was given to Congress in 1981 at the fiscal year 1982 authorization hearings), or consolidating its preparation with other efforts in an attempt to streamline the science planning activities of the Government.

Several other changes were made in 1977 in the NSF budget process since zero based budgeting (ZBB) was instituted. When ZBB was first started, NSF staff members prepared the required ZBB packages (giving funding at alternate decision levels). However, in an attempt to provide more Board control over the budget, in August 1977, the COB met to hear the Assistant Directors' presentation on their consolidated ZBB decision packages. Individual COB members then ranked the packages and, according to the minutes, the Director considered the COB members' rankings along with those of the Assistant Directors when preparing his ranking. This was discussed in a joint session of the COB and the Executive Council on August 16, prior to presentation by the Board on August 17. The adjustments made by the COB in the ranking for the fiscal year 1979 budget especially reflected the concerns of the NSB to increase funding for social and behavioral sciences and science education, as noted originally in its January 1977 report. At its meeting in August 1977, the Board decided that additional increases should be provided for science education and social sciences and, therefore, it (1) reallocated $5 million from the Directorates of Mathematical and Physical Sciences, and Engineering; and Astronomical, Atmospheric, Earth, and Ocean Sciences; (2) added $4 million to the Directorate for Biological, Behavioral, and Social Sciences, expressly for social sciences; and (3) added $1 million to Science Education, specifically for the Comprehensive Assistance to Undergraduate Science Education Program.[56]

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[54] CS : 193 : 2.

[55] Final Executive Board budget decisions are made in late summer and fall usually without benefit of this intense consultation with the NSB.

G. ESTABLISHMENT OF CURRENT BUDGET INFORMATION PROCEDURES, 1978

In 1978 Dr. Marian Koshland became Chairman of the COB and instituted several procedural changes which have greatly broadened the Board's impact on budget-making. Four changes of critical importance were: (1) inception of a long-range planning exercise which requires Assistant Directors to prepare written information, (2) debate about priorities of each directorate before the Board, with an NSB member serving as advocate for each directorate, (3) preparation of formal Board resolutions and reports on budget priorities, and (4) initiation of the cross-directorate program.

The current NSB practice will be described, in Subsection 2, below, by looking in detail at the Board's preparation of the fiscal year 1981 budget. The steps of this procedure were about the same for the fiscal year 1982 budget cycle, which is summarized in Subsection 3.

1. Written Long-range Plans Are Required From Assistant Directors; Representations Before Full COB and NSB.

The first change relates to the long-range planning exercise. Previously Assistant Directors prepared planning documents and gave oral presentations to members of the Committee on the Budget. The Committee on the Budget prepared preliminary recommendations for directorate-level budgets and asked the full Board to respond with suggested "opportunities," based on this information and June Planning Environment Review PER exercises.

Since 1978 this procedure has been changed to require program directors to present written projections of two kinds—based separately on (1) scientific need and on (2) desired budget growth. Also, whereas formerly the Assistant Directors made oral presentations only to the COB, now they make presentations to the full Board, which divides itself into task groups at its long-range budget planning meeting to consider in detail the projected needs and allocations of each directorate. An NSB member serves as a discussion leader in the presentation before the full Board and, in effect, serves as an advocate for a directorate.

2. The Board's Role in Preparing the Fiscal Year 1981 Budget

The NSF fiscal year 1981 budget cycle began in January 1978, when the Director issued target figures for each directorate for use in preparing the NSB required documents. The NSB fiscal year 1981 budget activity began with two long-range planning meetings—one in November 1978 and the other in February 1979. Prior to the meetings, in the early fall of 1978, the Assistant Directors and division heads, at the request of the Director, prepared a document titled "Priorities for the Support of Science" (now called "Opportunities and Needs in Science") which identified priorities and outlined research support needs within each of the directorates. Data were included to compare the program being discussed with other efforts in the NSF and related efforts in other Federal agencies. Scientific research as well as training programs were discussed. The document was intended to deal only with the next budget cycle, and was to focus less on the funding required and more on the science objectives that needed to be supported.[57]

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[56] COB, meeting 26, Aug. 17, 1977, and CS : 192 : 7.

A second document prepared for the November–February long-range planning cycle is the five-year long-range planning issues document. The one used for fiscal year 1981 budget was entitled "Long Range Planning Issues, FY 1981–1985," November 1978. In this document, each Assistant Director proposed a plan which is supposed to address realistically the needs of the directorate and which gives detailed five-year plans, identifying program goals and funding required for each separate program area. Estimates of program needs are given at two or three different budget levels for the five budget cycles (that is, low or stable, mid-range, blue sky). This document is intended to provide background for the Board's discussion of differential rates of support among the disciplines; it results in formal guidance for the Committee on the Budget. The Director requires that the division managers discuss these priorities and plans with their respective advisory committees before presenting them to the Board. For the fiscal year 1981 budget cycle this information was presented to the Board in November 1978.[58]

During its fall long-range budget meeting, the NSB divided into three working groups to hear the long-range presentations. The three groups were:

1. Long-Range Plans of Mathematical and Physical Sciences and Engineering (MPE), Biological, Behavioral and Social Sciences (BBS), and Astronomical, Atmospheric, Earth and Ocean Sciences (AAEO);
2. Long-Range Plans of Applied Science and Research Applications (ASRA), Science Education (SE), and Scientific Technological and International Affairs (STIA); and
3. Special Topics: Big Science Problems and Cooperative Agreement Act of 1977.[59]

Reports of the working groups were prepared and distributed in January for continued discussion at the February long-range planning meeting during which the Board divided itself into working groups, each dealing with the priorities of three directorates. Each working group heard a presentation by the Assistant Directors, who made a special case for his or her program. An NSB member led the discussion of each directorate's programs and acted as an advocate for the programs.

At its 202nd meeting, the Board adopted a resolution which ranked its priorities for level of magnitude and special science infrastructure support (that is, core support and instrumentation above all else) and which accepted the specific working group recommendations.[60] The working groups were very precise in recommending areas for emphasis or de-emphasis. For instance. Working Group 1, which dealt with the Behavioral, Biological, and Social Sciences, reported that emphasis should be placed on plant sciences, instrumentation, non-human primates, long-term ecological research, and problems of young investigators and that less attention should be given to marine laboratories, anthropological resources, chemical sensors (receptors), tropical biology, and gene and cell banks.[61] As another example, Working Group 2 stressed that in science education, the greatest attention should be given to research in science learning and teaching and precollege education.[62]

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[57] The latest available document, planned for guidance for the November long-range planning meeting beginning the fiscal year 1982 budget cycle, is: "Priorities for the Support of Science," Nov. 6, 1979. NSB–79–430. p. 52.

[58] National Science Foundation. Long-range Planning Issues, FY 1981–1985. Nov. 1978, NSB–78–426, distribution limited, various pagings.

[59] 202 : 2–3.

[60] CS : 204 : 6–7.

The February 1979 meeting, according to Dr. Koshland, resulted in "guidance which . . . was explicit and agreed upon by the Board and staff." She said that this exercise served two functions. One was informational—to assist the Board in formulating budget plans. The other was political, since there are times when the Director may choose not to take sides with one AD over another in a resource allocation dispute. In cases like this, the NSB serves the useful function of adjudicating the disagreement and making a decision. For example:

> It was the consensus of these meetings that for [fiscal year 1981] the highest priority should go to the growth of scientific research project support (SRPS) and associated instrumentation, rather than for support for facilities, centers, institutes and large capital investments.[63]

The Board guidance, which reflected the previous Board resolutions incorporating the working groups' guidance was expressed in the form of a three-page resolution giving detailed NSB recommendations regarding short- and long-term NSF budgets. The Board adopted the resolution (NSB/Res-79-23/B) at the February meeting. The Committee on the Budget was required to use it in preparing budget estimates. See Appendix J. The Board guidance stressed real growth above inflation, gave highest priority, first, to increasing core support and, second, to increasing funding for scientific instrumentation and equipment. It outlined a few specific priority projects in each directorate and outlined areas where readjustments might be made from the plans that the directorates presented.[64]

The Committee on the Budget used this resolution when preparing and recommending an aggregated general budget for fiscal year 1981, to be presented to the NSB in March 1979. Its recommendations were contained in a detailed COB report, NSB/BU-79-3, which included specific desired levels for directorates and discussed areas that should be emphasized. After discussing the report, the NSB voted to accept it. See Appendix K.[65] According to Dr. Koshland, this was a new special innovation in the fiscal year 1981 budget process since:

> In previous years the predominant method had been to look at current funding in each directorate and to propose percentage changes over that funding. This year the COB first estimated what total funds be necessary to follow the guidance of the Board, and then determined estimated amounts,

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[61] Report of Working Group 1. NSB–78–520 (Revised) 202 :37–38.

[62] Report of Working Group 2. NSB–78–251 at 202 : 41–42.

[63] CS : 208 : 6.

[64] Recommendations on the National Science Foundation long-range plans for fiscal year 1981 and subsequent years, as accepted by the National Science Board at its 204th meeting on Feb. 15–16, 1979. NSB/Res–79–23/B. Appendix E. NSB–79–89. CS : 204 19–21

[65] Committee on Budget Report and Review of Plans and Estimates for Fiscal Year 1981 and Subsequent Years, NSB/BU–79–3.

> which the COB finally compared with the ZBB proposals and the Director's recommended changes.[66]

Adoption of the report also served to mitigate the disagreements among Board members over priority funding areas.[67]

The Board expected the NSF Director to use the COB report as guidance that reflects the general priorities and philosophy of the Board. The document is not supposed to be distributed externally,[68] and the Committee did not intend that the Director be bound by the exact estimates in the report. However, the report gave specific guidance regarding NSB preferences for each directorate, although these did not appear to be measurably different from the directorates' preferences, with one exeption—in Science Education, the report recommended a more gradual increase than recommended by the directorate.[69] The COB report also contained instructions for dealing with OMB if the "mark" was lower than expected. Thus, for the fiscal year 1981 budget—

> If the budget "mark" received from OMB is lower than the proposed $1,225.6 million estimate for fiscal year 1981, the Committee recommended that top priority for basic research grants be maintained and that the areas of special emphasis be reduced accordingly with one exception—that the 25-meter millimeter wave telescope in AAEO be retained.[70]

In March the NSF submitted to the OMB, based on Board recommendations, its initial budget request for fiscal year 1981 for the President's spring review in late March. According to the schedule discussed by the Board, in June the OMB gave the agency a budget level or mark; during the summer NSF staff prepared zero based budget packages at various levels above and below the mark. The NSB Committee on the Budget considered the staff's budget and prepared its own report on preferred ZBB levels which differed markedly from staff's. The NSB then approved a budget resolution during August.[71] The Board resolution included the language that the "Board recognized that the Director might have to make certain adjustments in the distribution of funds during future negotiations with the OMB." [72] The Director used the funding levels recommended by the Committee on the Budget in its August 6 report when he submitted his budget to OMB, "NSF Budget Estimates for fiscal year 1981. Zero-based Justification of Estimates of Appropriations", Sept. 19, 1979. The Budget Committee also gave its preferred alternative funding levels, should OMB revise the budget.[73]

In September and October, OMB and the OSTP reviewed the agency budget submission; during November and December NSF staff negotiated with OMB over the program funding levels. Even though the Director keeps the NSB informed about negotiations, the NSB has little or no opportunity to influence decision-making at this stage, during which the Director might have to submit new initiatives, often at the request of the President, a situation which some Board members criticize since they do not have the opportunity to examine such issues critically. For instance, during the 211th meeting, the Director announced he had discussed, with OMB, two special initiatives proposed as add-ons: $26,000,000 for Careers and Literacy in Science (Science Education) and $3,000,000 for a U.S.-People's Republic of China Cooperative Program in Basic Sciences and Related Areas.[74] He added that decisions were pending on several other initiatives, including industrial innovation and the Cooperative Automotive Research Program. During this discussion, one Board member, Dr. Mac Lane, apparently seeing loss of NSB and NSF control over the budget, "urged the Director to distinguish between initiatives originating with NSF, i.e., OMD, [ocean margin drilling] and other initiatives which NSF may from time to time be asked to undertake. The latter, Dr. Mac Lane apparently believed, should be examined critically.[75]

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[66] CS : 205 : 9. NSB/Res–79–32.
[67] CS : 208 : 6.
[68] Remarks of Dr. Koshland.
[69] CS : 206 : 16.
[70] CS : 205 : 8.
[71] The COBs ZBB Report on the fiscal year 1981 budget was released on Aug. 6, 1979, as NSB/BU–79–12, pp. CS : 208 : 13–20
[72] CS 209 : 7.
[73] CS : 208 : 13 and NSB/Res–79–69. CS : 208 : 8–9.

Another innovation in the fiscal year 1981 budget process was the creation of a new budget category, called cross-directorate or multidirectorate programs, an idea that the COB supported. According to the Board:

> [This category] included a number of cross-activity programs not identified with specific fields of science, e.g., Industry/University Cooperative Research. Regional Instrumentation Facilities. Research Equipment and Instrumentation for 2-Year and 4-Year Colleges and Universities, U.S./U.S.S.R. Cooperative Science Programs, Research Initiation in Minority Institutions, Planning and Policy Studies Program, Post-doctoral Fellowships, Young Investigator Research Support, Research Cost Allowances for NSF Fellows, and the Experimental Program to Stimulate Competitive Research.[76]

In some respects the multidirectorate efforts can be considered to be "Board programs" since they fall outside of the directorate structure, are congressionally imposed, or are programs of a controversial nature which the Board had considered in detail before authorizing funding for them. The budget request for this area, now called Cross-Directorate programs, was $51,950,000 for the fiscal year 1981, about double the request for the fiscal year 1980. These efforts were eliminated under the Reagan budget proposals.[77]

3. *The Board's Role in Preparing the Fiscal Year 1982 Budget*

The Director's planning sequence for the fiscal year 1981 budget began in January 1979 when he issued instructions and projection rates to the Assistant Directors to use in preparing relevant documents for presentation to the Board for discussion in the fall budget long-range planning meetings. The Board's planning sequence for the fiscal year 1982 budget began during the June substantive long-range planning meeting. The long-range planning meeting, dealing with funding and directorate priorities, was held in February 1980, during which the Board received materials for the fiscal years 1982 through 1986. The Assistant Directors presented their long-range plans, followed by Board discussion of directorate priorities led by Board members as follows: STIA: Dr. Cobb; Science Education: Dr. Cota-Robles; Mathematical and Physical Sciences: Dr. Kasha, Astronomical, Atmospheric, Earth and Ocean Sciences: Dr. Salpeter, Biological and Behavorial Sciences: Dr. Rich, Engineering and Applied Science: Dr. Pettit;[78] Cross-directorate: Dr. Hubbard.

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[74] See, for instance, the discussions at the November 1979 NSB meeting: CS : 211 . 9.

[75] CS : 211 : 9.

[76] CS :208 :6.

[77] National Science Foundation. Budget in Brief [Presentation to the Congress.] FY 1981. p. 51.

A few other changes were made: the Priorities in Science document was renamed "Opportunities and Needs in Science" (ONS) and is described as a qualitative view by the directorates of means and opportunities in science within approximately a five-year period. In preparation for the meeting, the Board also was sent a volume on five-year projections (of programs at three different growth rates, that is, constant, limited growth (12 percent) and substantial growth (17 percent).[79] During the February meeting Board members were provided with documentation regarding the issues to be discussed at the June meeting (whose preparation had begun in January) as well as the ZBB documentation for the previous year's budget.[80] For a summary of the key event in the budget cycle, see Table 13, "Key Events in the Planning and Budget Cycle."

TABLE 13.—KEY EVENTS IN PLANNING AND BUDGET CYCLE

Step	Timing	Participants	Principal materials
Internal budget preparations	January-October 1979.		
NSF Director issues instructions and projection rates for fiscal year 1982.			
NSF Director provides funding totals to each Directorate for "constant level."			
Directorates update/revise "Opportunities and Needs in Science" (ONS).			
Directorates provide ONS materials to OPRM.			
Updated ONS report printed.			
Director's 5 yr projections to OPRM.			
OPRM/Directorates Review and Coordinate Materials.			
Director/AD meetings on 5-yr projections.			
ONS and division projections provided to NSB members.			
Annual planning environment review: In-depth discussion of 2 or 3 longer-range concerns that affect many fields of science.	June 1979	NSB with Foundation management; sponsored by PPC.	Staff papers and commissioned studies.
NSB review of long-range plans, fiscal years 1982–86:	October 1979–March 1980.	NSB with Foundation management.	Planning papers, 5-yr projections.
Discussion of overall scientific and program priorities, to provide guidance on preparing budget estimates.			
Discussion by PPC of broad policy outlines.	October 1979	PPC with NSF staff	Broad outline of Directorates plans.
Discussion of priorities by PPC with NSB	November 1979	PPC with NSB	Status of Science Reviews; Priorities in Support of Science; Director's Overview.
NSB working groups review projections; results in guidance to COB.	February 1980	NSB with NSF management.	5-yr projections at 3 levels.
COB provides guidance for preparation of multiyear estimates.	February 1980	COB with NSF management.	NSB resolutions.
NSB reviews COB's estimates, which are then transmitted to OMB.	March 1980	NSB, COB	
President's spring review: Executive Office "previews" agency plans and aggregates estimates.	April to June 1980.	OMB, OSTP, with some interaction with NSF.	NSF multiyear estimates

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[78] EAS stands for Engineering and Applied Science.

[79] CS :213 :5.

[80] PPC–79–16 :4.

TABLE 13.—KEY EVENTS IN PLANNING AND BUDGET CYCLE—Continued

Step: Purpose	Timing	Participants	Principal materials
Preparation of zero-based budget package, fiscal year 1982:			
With NSB and OMB guidance, formulation of detailed Foundation-wide budget at several dollar levels.	June to September 1980.	COB, NSF, NSB staff	Drafts of ZBB package to OMB and related documents.
COB review	July 1980		
NSB review	August 1980		
President's fall review, fiscal year 1982 budget: OMB reviews detailed budget (with OSTP participation); recommended amounts for NSF to be included in President's budget.	September to January 1981.	OMB, OSTP; considerable interaction with NSF.	ZBB package and related documents.
Congressional consideration: Review and hearings leading to authorization of programs and appropriation of funds.	February to September 1981.	Congressional committees, leading to floor action on bills; NSB and NSF management.	NSF budget to Congress, testimony, hearing record, and related materials.
Formulation of operating plan, fiscal year 1982: Director prepares detailed operating plan based on congressional adjustments to budget request.	September 1981.	NSF management in consultation with NSB, OMB and congressional committees.	Operating plan and allocation documents.

Source: Provided by NSB.

There was a lengthy discussion of long-range issues during the February 1980 meeting. The main themes as summarized by the chairman of the PPC were: the "continuing need for core support, research equipment, and facilities grants, support for computer science, industry-university cooperation, and engineering, both basic and applied."[81] Also in February 1980, the Board discussed the first report of the Commitee on the Budget regarding its 1982 budget request. During the March 1980 meeting, Dr. Koshland reviewed in detail a Committee on the Budget report distributed at the meeting which reflected the preliminary budget estimates for fiscal years 1982–1984, that resulted from the NSB guidance at the February long-range planning meeting. The report divided program support into several categories: programs that should continue at the same level of effort in fiscal year 1982 as 1981 (which would receive an inflation adjustment of 12 percent), those that should experience modest growth in real dollar terms (which would receive an additional 5 percent over inflation); and those that should be deemphasized: (no inflation adjustment.[82]

Among the Board recommendations were:

Directorate for Mathematical and Physical Sciences (MPS): real growth for mathematics, physics (except nuclear physics), chemistry, and materials sciences (not including the Materials Research Laboratories) and special emphasis for computer research.

Directorate for Astronomical, Atmospheric, Earth, and Ocean Sciences (AAEO): real growth in scientific research project support in Astronomy, same level funding for Atmospheric Sciences and Coordinated Ocean Research, and inflation adjustment for other programs; provision for future funding for a 25-meter millimeter wave telescope; AAEO was also requested to examine carefully proposed large scale expenditures and associated future year operating costs, and to propose items to be eliminated if recommendations were made for significant new capital expenditures.

Antarctic Research: inflation adjustments, deferral of spending for large new capital items until funding becomes available.

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[81] CS:213:11.
[82] CS:214:5.

Directorate for Biological, Behavioral, and Social Sciences (BBS): special funding emphasis for Social and Economic Sciences, real growth in Physiology, Cellular and Molecular Biology and the Behavioral and Neural Sciences, and level funding for Environmental Biology. The report stated that the Board did not wish to initiate any additional long-term environmental centers.

Directorate for Engineering and Applied Science (EAS): special emphasis for Engineering and inflation adjustment for Applied Research.

Directorate for Science Education (SE): marked increase in Science Education with particular emphasis on research related to teaching and learning of science; funding at the fiscal year 1981 level for Science and Society programs.

Directorate for Scientific, Technological, and International Affairs (STIA): special emphasis to increased cooperation with lesser-developed countries, especially in Latin America, inflation adjustments for Policy Research and Analysis and Science Resources Studies; no increase for Information Science.

Cross-Directorate programs: inflation adjustment for all activities; funding doubled for the new University Research Facilities Improvement Programs.[83]

During the March 1980 meeting the Assistant Directors also made plans for funding special efforts which should be preserved considering that the President had proposed cuts in the budget for fiscal year 1982. At the next meeting in April, the Committee on the Budget presented the Board with revised estimates for fiscal year 1982 based on the discussion at the March meeting. These included:

> A marked increase in science education in support of the Board's view of the need to identify and develop high caliber scientists and engineers and to emphasize research on teaching and learning,
>
> Special emphasis to investigator-initiated projects in applied research, low-level figures for other applied science programs, elimination of funding for the nutrition program,
>
> Reversal of its decision on MPS so that the funding level need not imply a deemphasis for nuclear physics; and
>
> Increase in AAEO by $10 million, primarily to fund the first year of construction of the 25 meter millimeter wave telescope.[84]

The final version of the COB report for the fiscal year 1982 budget prior to receipt of the OMB "mark" (target for NSF) was transmitted to the Board on May 9, 1980 as NSB/BU/80-3. The report recommended a budget of $1,270 million. This report also stressed:

> Wherever possible small research project support was to receive preferential increases,
>
> Support for large facilities was to be maintained at the fiscal year 1981 level of effort including an adjustment for inflation, and
>
> Large capital expenditures were to be carefully reviewed and documented to ensure the inclusion of realistic estimates

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[83] CS: 214: 5-7.

[84] Quick minutes, 215, p. 3 and CS: 215: 6-10.

of future operating costs and recommendations for corresponding items to be eliminated.[85]

Subsequently during the summer, the OMB asked NSF to develop a zero based budget totaling $1.180 billion. Dr. Koshland reported that, following the practice of previous years, the Committee on the Budget recommended that the budget be prepared "at a higher total, i.e., $1.270 billion with particular attention to the distribution of funds at the $1.180 billion level." In addition, the acting Director and the Committee were recommending that NSF propose two "presidential initiatives for possible add-on funding over and above any budget total: $100 million for university research facilities improvement and $40 million for engineering education and research, and an add-on of $57.4 million for U.S. Antarctic Research Program." The NSF fiscal year 1982 budget President Carter submitted to the Congress totaled $1,353,500,000. The Reagan Administration budget for fiscal year 1982 was cut back to $1,033,500,000. Most of the science education programs, international activities, social sciences, and innovation activities were cut back or eliminated. OMB reportedly did not consult the Board in making these cuts.

H. OTHER FUNCTIONS OF THE COMMITTEE ON THE BUDGET

1. *Infrequent Communications With OMB and OSTP*

As noted above, the Committee on the Budget is charged with serving as the official liaison with the Office of Management and Budget, regarding budget matters. As far as can be ascertained from the minutes of the Board, the Committee on the Budget has not done this to a significant extent. Two important examples of OMB decisions which bypassed the Board include OMB's initiation of the RANN program in 1971 and the Reagan Administration budget cut of about $325 million from the Carter Administration fiscal year 1982 budget.[86] In fact the Reagan Administration made decisions directly opposite to the NSB preferences as exhibited, for instance, in its cuts of social science research and funding for instrumentation. From time to time, OMB and OSTP officials have made presentations to the Board, but usually on generalities. For instance, the President's Science Advisor, the OMB Director or a staff member of the OSTP have attended Board meetings to discuss a President's philosophy or rationale for science budgets. Typically these discussions are held in a "closed" or "closed executive" Board meeting. For instance, in March 1972, Dr. Edward David, the President's Science Advisor and David Beckler, the Executive Secretary of OST staff briefed the full Board on the President's views.[87] In March 1979, Dr. Frank Press, President Carter's Science Advisor, accompanied by Philip M. Smith, an Assistant Director of the OSTP, briefed the Board regarding:

Pluralism for support of basic research as evidenced by re-entry of the Departments of Defense and Energy into basic research support,

Reorganization plans relating to the proposed Departments of Natural Resources and Education, the International Development Cooperation Administration, and the proposed formation of the Institute for Scientific and Technological Cooperation,

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[85] CS : 218 : 2.
[86] See chapter X and section G of this chapter.
[87] ES : 145 : 8.

New postdoctoral fellowship programs, and
Changes in OMB Circular A–21.[88]

If there are informal discussions between NSF, OMB, and OSTP officials, the minutes do not reveal them. The Director does, from time to time, report on discussions he has had with OMB officials, either in the early planning phases of a budget or during the reconciliation phase after the mark has been received.[89]

There is little indication that either the Director or NSB officials have attempted to change decisions made at OMB regarding NSF's budget.

2. Assignments from Board Chairman

Also from time to time the Board Chairman refer to the Committee on the Budget, certain questions regarding initiating or modifying programs, which may have emanated from other Board committees. For instance, in March 1980, the Chairman asked the Board to:

(1) Consider what action, if any, the Foundation should take concerning the future of the Naval Arctic Research Laboratory, and

(2) Take under advisement the recommendation of the Committee on Minorities and Women in Science that important consideration be given to maintaining the current level of funding for minority-focused programs within the Directorate for Science Education even though certain programs have been transferred to the Department of Education.[90]

During the February 1980 meeting the Board Chairman referred to the Committee on the Budget, the following recommendation, which the NSF Advisory Committee for Science Education made at the January meeting:

> The NSF should accord a higher priority for science education and significantly increase its funding in substantial increments over the next four or five years. This new level of funding should be achieved without sacrifice of support to other essential Foundation activities.[91]

3. Role Vis-A-Vis Congress

The Committee from time to time also has been asked to take a position on budget-related congressional issues. For instance in March 1977, the Committee on the Budget reported out a resolution on multi-year funding which "encouraged the Foundation to seek a two-year authorization with adequate provision for program flexibility and hearings on issues of special interest to the Congress." [92] This provision appeared in S. 855, the Senate Authorization bill for fiscal year 1978.

The Board plays another role with respect to budgeting—that is, in testimony before the House and Senate authorization and appropriations committees. Prior to 1974, when Dr. Hackerman became Board Chairman, the Board's testimony always seemed philosophical and esoteric—regarding science in general with very few details of Board decisions or justification of NSF priorities. During his incumbency,

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[88] CS : 205 : 2–3.

[89] For instance, the Director reported at the executive session of meeting 145 that he had discussed the NSF budget with OMB Director George P. Shultz and other OMB officials. (ES : 145 : 14.)

[90] March 1980 meeting, Quick memo, p. 3.

[91] Preliminary Report on February Board Meeting, Feb. 2, 1980. p. 3. (NSB–80–103.)

[92] 188 : 20.

Dr. Hackerman's testimony provided more details regarding Board-enunciated policies and Board activities. This trend has continued with the incumbency of Dr. Branscomb. For instance, at hearings before the House Committee on Science and Technology in January 1981, Mr. Doan, the Vice Chairman, clearly articulated NSB budget priorities for the Committee. However, it is still basically the burden of the NSF Director, Assistant Directors, and program managers to justify NSF programs and expenditures before the Congress.

I. CONCLUDING OBSERVATIONS

Within the last three years, the Board seems to have gained some control over the budget process, but this control extends only to the internal NSF decision processes, and even this is limited. Previously the Board had little clearly developed information regarding why program managers sought program increases or about the output of NSF-supported programs and their relationship to overall science funding trends. The Board acted on budgets generally by recommending percentage increases at aggregated levels, with little or no opportunity to make decisions at the program or project level. Since 1978 the Board has gained control over some of the science and budget trend information which program managers use to make priority decisions, has developed ways to discuss priorities with program managers, has instituted procedures to link the substantive and financial long-range planning and budgeting exercises, has adopted procedures to allocate funds at the program level, and has taken steps to assume influence in the negotiation phase of the budget-making process, after the Director and OMB start attempting to iron out differences between NSB/NSF recommended levels and OMB targets. Although the Director is still substantially in control of the processes by virtue of his control of the flow of information to the Board before and during its budget deliberations, the Board's actions do indeed seem to have impacted on the budget. The initial budget the Director sends to the OMB is the Board-formulated budget. Once the budget is sent to OMB, the Board has little or no ability to influence the major protagonists in NSF budget-making—OMB and the Congress.

One remaining question is: Would NSB budget processes be enhanced if the Board established formal links between the Programs Committee and the Budget Committee to improve the flow of information regarding current issues. Now the only communications link consists of the attendance of the Budget Committee chairperson, Dr. Koshland, at the Programs Committee meetings.

VIII. NSB ANNUAL REPORTS

A. INTRODUCTION AND OVERVIEW

Prior to the passage of Public Law 90–407 in 1968, the Board often inserted a letter or prefatory comments into the NSF annual report. Usually these were "philosophical statements or reviews of major issues of the day."[1] The 1968 amendments, however, required the Board to render an annual report ". . . on the status and health of American science and its various disciplines" to the President for submission to the Congress. The requirement was abolished in 1976 with passage of Public Law 94–282, the National Science and Technology Policy Organization, and Priorities Act of 1976. There is no explanation for this move in the legislative history of the Act. Presumably the requirement was abolished in the expectation that the reporting requirements given in the Act to the statutorily created White House science policy apparatus, the Office of Science and Technology Policy, would fulfill the functions of the NSB report. The Act required the OSTP to prepare an annual report on the status of science and technology with recommendations for its improvement and a five-year outlook. The requirement that the Board produce an annual report was reinstated with the passage of Public Law 95–99 in 1977 upon the recommendation of the Board. However, the purpose of the required report was reduced from the broad national science policy requirement to report ". . . on the status and health of American science" to the more limited goal of reporting basically on science policy issues which more directly affect NSF. Specifically, the current requirement reads: "Such policy report shall deal essentially, though not exclusively, with policy issues or matters which affect the Foundation or with which the Board in its official role as the policymaking body of the Foundation is concerned." (Sec. 4.j of the NSF Act.)

As a whole, members of the Board maintain that while they want to retain authority to prepare a report they want to choose to produce a report only when it believes one is warranted. The Board apparently feels that its policymaking function might be met better if time were allocated to functions other than annual production of a time-consuming report which. according to some critics, often serves little policymaking purpose. Therefore, during 1980, the Board adopted a resolution calling for legislative changes which would make the Board report series *Science Indicators*, mandatory every three years, and would allow the Board to produce substantive reports in alternate years as the Board wanted. This legislation has not yet been enacted.

This chapter will deal with procedures used to produce reports, costs, the Board's role in determining subjects for reports, the relationship between the Board and the Office of Science and Technology Policy in relation to statutorily required reports, and a proposal to prepare annual compilations of NSB recommended policies.

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[1] National Science Board. Non-dated, provided by NSB, p. 11.

B. SUBJECTS OF BOARD ANNUAL REPORTS: THE CHANGING NATURE OF BOARD REPORTS OVER TIME

1. The First Four Substantive Reports

Early in its history the Board agreed to follow a common conceptual format for its reports dealing with "... the status and health of American science and its various disciplines." The format was: (1) state of the art; (2) nature of the enterprise; (3) health of the U.S. effort; and (4) recommendations.[2] The Board's first four reports generally followed this pattern. They were:

Annual report no. 1. 1969—"Toward a Public Policy for Graduate Education in the Sciences," 63 pages (NSB–69–1) and "Graduate Education—Parameters for Public Policy," 168 pages (NSB–69–2). The report and its statistical supplement (NSB–69–2), analyzed the situation and characteristics of graduate education in the United States and proposed a national policy for graduate education, with specific recommendations for educational institutions, for State and regional planning, and for the Federal government.

Annual report no. 2. 1970—"The Physical Sciences," 62 pages (NSB–70–1). The report analyzed the status, nature, and health of the physical sciences in the United States and included 16 recommendations about a Federal policy for the physical sciences, including coordination, manpower, and funding.

Annual report no. 3. 1971—"Environmental Science—Challenge for the Seventies," 50 pages (NSB–71–1). The report examined the status of environmental science and concluded that, at that time, 1971, environmental science was unable to match the needs of society for definitive information, a predictive capability, and an analysis of environmental systems. It made five recommendations to meet the situation, including research and large ecosystems, global research, funding continuity, and curriculum development. The report had a supplement, entitled "Patterns and Perspectives in Environmental Science" (NSB–73–2), which presented the views and judgments of scientific leaders on a broadly representative array of topics describing the scope and nature of environmental science.

Annual report no. 4. 1972—"The Role of Engineers and Scientists in a National Policy for Technology," 48 pages (NSB–72–1). The report examined how science and engineering, through technology, might be brought to deal with society's problems more effectively. Five recommendations were made regarding the Federal role in such efforts.[3]

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[2] ES : 126 : 2.

[3] The recommendations were: (1) Government policy should encourage the injection of basic and applied research activity into mature industries, and the maintenance of a high level of such activity in technologically advanced industries; (2) Government-aided R and D efforts should support the development of socially useful technologies not produced by market forces; (3) Government should make an effort to develop and take advantage of manpower and methodology capable of analyzing and exploring resolutions to large-scale complex problems of national importance; (4) Government and industry together should undertake an effort to educate the public regarding technology; and (5) Federal agencies should develop technology assessment capability where needed for informed public and agency decisionmaking.

2. *The Science Indicators Series*

In 1970, during a discussion of preparations for the Board's fifth annual report for 1973, Dr. Roger Heyns, the Board Vice Chairman, noted that in September 1970 the President had requested the Office of Science and Technology and the President's Science Advisory Committee to "submit each May a report on the status and health of science and technology."[4] Therefore he made two suggestions in connection with helping the Board reconsider ". . . the nature of its annual reports." One, which seems to have received little subsequent attention, was for the Board to issue an occasional white paper on policy independent of the annual reports. The other was to produce an annual report ". . . that would provide base-line data for each year with a series of chapters providing an assessment of the health of science," an effort intended presumably to maintain a national policy role for the Board despite presidential intentions for the White House science policy advisory apparatus. Subsequently the Board agreed to this notion which, in effect, initiated the Board's *Science Indicators* series. Dr. Heyns was named the chairman of the first NSB committee that worked on this kind of report.[5] Apparently, the existing Science Resources Studies Unit (SRS) felt that it should be used to produce such reports. However, presumably the Board wanted more qualitative, output-oriented, "softer data," than SRS was comfortable working with. As a result, the *Science Indicators* report was produced first with staff hired specifically for that purpose and attached to the Board offices. Subsequently, the NSF Director create a separate unit in the SRS to prepare the report. Several reasons were given to explain this move: the report received critical acclaim and, therefore, presumably was safe from attack; the report made use of SRS-collected data; and Director Atkinson wanted to move NSB support activities under closer control.[6]

The *Science Indicators* report series has been produced four times thus far, for 1972, as the fifth Board report (NSB–73–1), 145 pages; for 1974, as the seventh Board report (NSB–75–1), 242 pages; for 1976 as the ninth Board report (NSB–79–1), 304 pages, and for 1978, as the eleventh Board report (NSB–79–1), 263 pages. The *Science Indicators* report for 1980 is scheduled to be released in 1981. The indicators data series included have been updated and refined over time. In 1973 the Board made a conscious decision to work with other Federal agencies to produce output indicators of science and technology which eventually would be able to describe major scientific advances, technological achievements, and contributions of science and technology to the national welfare and to specific national goals.[7] As the series progressed, more explanatory and textual material has been added, as were survey data regarding the public's opinion about science and technology. However, unlike the early substantive NSB annual reports, the *Science Indicators* series does not include recommendations for public or private action.[8] The preparation of the *Science Indicators* report series departs from the typical NSB annual report pattern in that the report is produced in-house by a staff unit affiliated with the NSF Division of Science Resources Studies. NSB had located the production unit in the NSB office for the first *Science Indicators* report, but subsequently incorporated it into the administrative unit housing other NSF data production efforts apparently on the grounds that the SRS unit should have more control over the effort.

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[4] ES : 133 : 3.
[5] Ibid.
[6] Interview.
[7] ES : 153 : 14.

The report series has been critically acclaimed. It has also been criticized, as evidenced by a General Accounting Office report[9] which faulted the absence of an appropriate conceptual model. The Board responded to this GAO report in a letter sent jointly by the Director and the Chairman of the Board. The Board found the GAO criticism "not valid."[10] Generally the series seems to be regarded as a useful tool.[11] The Board's thirteenth report for fiscal year 1981 will be part of the *Science Indicators* series.

3. Topics of Substantive Reports Since 1974

The topics for the Board's sixth annual report for 1974, eighth annual report for 1976, and tenth annual report for 1978, were suggested by the PPC. The preparation of each of the three reports began before the legislation was passed to rescind the Board's report writing requirement. However, perhaps anticipating the legislation that would be passed restoring the requirement, but to serve a more limited, rather than the broader national science policy goal of assessing the health and status of science, the topics of these subsequent reports depart significantly from the earlier reports which assessed the health and status of particular areas of science and made recommendations to strengthen them. These latter reports instead address more diffuse science policy issues. They do not include recommendations and, since they contain considerably more background data and analysis and are usually longer than their predecessor reports, they may be characterized more as research reports than as advisory reports.

Annual report no. 6. 1974—"Science and the Challenges Ahead," 56 pages (NSB-74-1). The report examined some of the major problems facing the Nation and the world: population growth, health care, food supply, energy demand, mineral resources, climate changes, and environmental alteration, and discussed how increased private and Federal research efforts in science and technology could alleviate specific aspects of these problems.

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[8] Annotations for each of the published reports follow:

Science Indicators 1972 (1973). The Board presented indicators of the status and health of U.S. science based largely on readily available data. The report focused on the international position of U.S. science and technology resources for research and development, resources for basic research, science and engineering personnel, institutional capabilities, public attitudes toward science and technology, and expert opinions regarding the current status of U.S. science. Indicator highlights and a statistical appendix were included.

Science Indicators 1974 (1975). This report contained substantially more indicators than the first Science Indicators report and is about 50 percent more lengthy. The 1975 report focuses on international indicators of science and technology, resources for research and development, basic research, industrial R and D and innovation, science and engineering personnel, and public attitudes toward science and technology. Highlights and raw statistics are included as in the 1973 report.

Science Indicators 1976 (1977). The organization of the Board's 1977 Science Indicators report was similar to the previous Science Indicators report (1975), but coverage of the six general categories of indicators was somewhat expanded, as was the statistical appendix.

Science Indicators 1978 (1979). A number of significant changes were incorporated into this report. For the first time in the report series, external reviews were used for individual chapters. More data interpretation and analysis were included and major policy questions were identified. Limitations and alternative interpretations of data and references to other publications were made. A comprehensive, substantive index was included. The overall organization is similar to the 1977 report, except that this report did not contain a chapter on public attitudes toward science and technology. The Board apparently is developing a more sophisticated approach to this subject and the data developed will appear in future Science Indicators reports.

[9] U.S. Comptroller General. Science Indicators: Improvements Needed in Design, Construction, and Interpretation. Washington, U.S. General Accounting Office, Sept. 25, 1979, p. 70. (PAD-79-35.)

[10] CS: 211: 16-17.

[11] Press, Frank, Science and Technology in the White House, 1977-1980: Part I. Science, v. 211, Jan. 9, 1981: 141.

Annual report no. 7. 1976—"Science at the Bicentennial—a Report from the Research Community," 154 pages (NSB–76–1). The report, based on over 600 responses from industrial and academic scientists to a Board inquiry, assessed factors affecting, or likely to decrease, the effectiveness of research in the near future unless specially addressed. No recommendations were included in the Board report. However, greatest respondent concern focused on the issues of dependability of funding for research, vitality of the research system, freedom in research choices, and negative attitudes of the public toward science and technology.

Annual report no. 8. 1978—"Basic Research in the Mission Agencies—Agency Perspectives on the Conduct and Support of Basic Research", 45 pages (NSB–78–1). The Board presented descriptions of research programs within the Federal Government and of selected aspects of Federal support of basic research, as well as a comparative and historical overview of basic research in the Federal agencies. Agency research was discussed in terms of performer categories, research fields, research management, legislative impacts, and current barriers to optimum support. The report highlighted: (1) the utility of basic research to mission agencies, (2) the decline in Federal basic research expenditures in constant dollars since 1968; (3) mission agency concerns about basic research funding and management; and (4) the relative decline of industrially supported basic research.

4. *Reinstatement of Requirement to Prepare Annual Reports*

The February 1977 Board minutes note that "It was the consensus of the Board that the necessary action should be taken to reinstate in the NSF statute the requirement for an annual report from the Board to the President and the Congress."[12] This language was included in Public Law 95–99, the NSF fiscal year 1978 authorization Act. But, as noted above, the purpose of the reinstated report was more limited: to report basically on science policy issues which more directly affect NSF. Specifically, the new requirement reads: "Such policy reports shall deal essentially, though not exclusively, with policy issues or matters which affect the Foundation or with which the Board in its official role as the policymaking body of the Foundation is concerned."

The restoration of the reporting requirement followed discussions between the full Board and Dr. Frank Press, the science adviser, on March 18, 1977.[13] During this meeting, Dr. Press told the Board that pursuant to Reorganization Plan No. 1 of 1977, OSTP was shifting to the National Academy of Sciences, via contract, responsibility for preparing the Five-year Outlook report required by Section 206 of Public Law 94–282. He wanted to explore with the Board the possibility of its assisting in preparing the OSTP statutory annual report to the President and the Congress, as required by Section 209 of Public Law 94–

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[12] CS : 187 : 5.
[13] CS : 188 : 4.

282. He proposed that collaboration take the form of a combined report from OSTP and the Board. Specifically:

> Dr. Press suggested possible mechanisms, including a combined annual report from the Board and OSTP. For instance, a report could be developed with a major thrust with a separate section being devoted to a specific message from OSTP. The proposed tenth Board report on basic research by the mission agencies was cited as an example of an appropriate report on which the two organizations could collaborate. In addition to the material being assembled by NSF, OSTP could request each agency to respond to the specific questions in Section 209. The responses could then be combined by NSF, reviewed by OSTP, and included as a separate section of the Board report or released as a separate document. The Board report would thus maintain its identity but would gain an additional impact by the OSTP addition.[14]

It was suggested at the same meeting, however, that the *Science Indicators* report remain a separate series, since it had received a well-deserved reputation in the science policy community.[15]

Following this discussion the Chairman appointed an Ad Hoc NSB Committee on NSB and OSTP Annual Reports to explore the possibility of assisting the OSTP, or combining forces with it, to prepare one report.[16]

The subjects of the Board's reports initiated subsequent to adoption of these criteria coincide with the statutory guidelines. (See Section 3, above.) The twelfth report, generated by the work of the Committee on Science and Society, will consist of case studies assessing the impact of research upon the general welfare, including the issues of medicine, synthetic fibers, computers, semiconducters, pesticides, and seismic methods.[17] It is being prepared under contract by outside science writers.[18] The report is overdue.[19]

The fourteenth Board report will deal with University/Industry Cooperation in Science. The report writing committee is chaired by Mr. Doan.[20] A contract was awarded to New York University [21] for a field study of university/industry relationships, and may include an historical study of such relationships in the development of chemistry and chemical engineering. The report is due on March 31, 1982.[22]

C. PROCEDURES USED TO PRODUCE A REPORT

Before the Planning and Policy Committee began its long-range policy planning activities in the mid-1970s, NSB members were asked by the Director to suggest topics for Board reports or a Board report committee was established to recommend topics. Since the mid-1970s, the subject of Board reports seem to be spin-offs of topics discussed originally in connection with annual June long-range planning activities. After the Board votes on a topic, the Chairman establishes a Board committee to prepare drafts, or oversee contractors or consultants who prepare drafts. Generally, the annual report committee is established two or three years before the report's publication date. As a result, generally the Board has two or three report committees active at the same time. The Board report committee also is responsible for reviewing successive drafts and editing the report to its satisfaction before delivering it to the full NSB, which must vote to release the report for publication. Board minutes indicate that more often than not the full NSB has recommended changes in a draft even after the committee reported it out and has spent considerable time reviewing, editing, and deciding whether to approve successive draft chapters of annual reports.

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[14] CS : 188 : 5.
[15] Idem.
[16] Ibid., pp. 3–4.
[17] CS : 196 : 2.
[18] CS : 213 : 4. CS : 206 : 6.
[19] Interview.
[20] 212 : 4.
[21] CS : 218 : 2–3.
[22] 216 : 4.

1. *Examples of How the Board Participates in Preparing Annual Reports*

The Board has played a variety of roles with respect to the annual reports—ranging from selecting contractors to write various chapters, advising the staff on the kinds of analysis or data to be included, and preparing recommendations for inclusion. In recent years, however, the Board has not made noticeable efforts to write the annual reports itself. A few excerpts from the minutes illustrate these kinds of interaction regarding the first *Science Indicators* report:

> While guided by a Board committee, the actual construction of report, identification of useful material, choice of format, analysis of the data employed, and preparation of the text were all undertaken and completed by the staff. . . .[23]

Regarding the fourth *Indicators* report:

> On the question of the inclusion of personnel projections in the "Science and Engineering Personnel" chapter of Science Indicators—1978. Board Members had voted approximately three to one in favor of including the projections in the report. . . . Following a discussion of specific objections made by Dr. Mac Lane as to the validity of projections, and a detailetd presentation by the NSF staff of the rationale used. . . . The Board unanimously agreed that *Science Indicators*—1978 would contain a text discussion of the range of projections resulting from different models; further, the Board agreed the "Appendix" should contain a technical note on the assumptions of the various project models.[24]

With respect to the twelfth report, the NSB noted:

> The Committee on Twelfth NSB Report is continuing to work on revising chapters which have been reviewed by the Board. A new chapter on computers and semiconductors has been received. At its May meeting the Committee will review the new chapters on computers and semiconductors, and on

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[23] 158: 2.

[24] CS :204 :3–4.

> radiation in medicine, and the revised draft papers on synthetic fibers, and on pesticides and pest control.[25]
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> [The] Chairman reported that at its September meeting the Committee held an extensive discussion with the science writing team about the themes and thrusts of the report. The schedule for the production of the first and second drafts was altered to allow for more time for the science writers.[26]

Regarding the fourteenth report on university/industry relationships, the excerpts indicate the following kinds of Board involvement:

Identification of themes with report writing team:

> The Committee on Fourteenth NSB Report will consider a set of research questions to guide the collection of information on gaps and knowledge regarding the university/industry relationship.[27]

Limiting scope of report: identifying objectives:

> [The] Chairman reported that . . . the Committee decided to limit the scope of this report to research collaboration between universities and industry. He noted that the Committee believes there is fertile ground for this type of interaction without Government intervention, and the Committee intends to explore ways to encourage research collaboration through this report.[28]

Outlining research needs and the particulars of a request for a proposal for a contractor field survey:

> The Committee . . . completed discussion and design of a "Request for Proposal" (RFP) for a field study of university/industry research relationships. This RFP will be issued soon. At its May meeting the Committee planned to consider a possible small historical study of university/industry research relationships in the development of chemistry and chemical engineering.[29]

As another example of NSB impact on annual report writing activities, the Board, apparently dissatisfied with the staff delays, appointed a "facilitator" at its October 1980 meeting to hasten completion and release of the *Science Indicators* report for 1980 (despite the fact that the Board report was being prepared under the full-time direction of the Science Indicators unit).[30]

2. *Examples of Significant Participation by Some NSB Members*

The minutes also indicate that often individual NSB members play significant roles in the formulation of annual reports. For instance, Dr. Saunders Mac Lane often has been cited as having made important contributions to the *Science Indicators* report series. The notes of the closed session of meeting 198 report:

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[25] 216 :8.
[26] 210 : 11.
[27] 214 :9.
[28] 216.4.
[29] 216 : 4.
[30] 219.

> [The] Chairman of the Committee on the Ninth NSB report indicated that Dr. MacLane and the staff had spent considerable time and effort on the manuscript since the March meeting and had produced a much improved draft. Dr. Zumberge stated that he would like the record to show that Dr. MacLane's personal attention to the reoprt had resulted in a document that was improved in almost every way. . . .[31]

In a closed session of meeting 204, it was reported that:

> [Regarding *Science Indicators* 1978] Dr. MacLane discussed his position on the validity of projection statistics. His memorandum to the Board of February 12 on this subject is an attachment to NSB–79–79. His objections were quite explicit and technical in nature and dealt in the main with the report's projection methodology.[32]

Apparently Dr. MacLane also played a major role in the decision to broaden the data base of Science Indicators to include public opinion survey data on science and technology [33] and to improve the quality of the questionnaire.[34] The 1978 version of *Science Indicators* did not include a survey of attitudes; however, the Foundation plans to report the results of a survey in the 1980 version, using a questionnaire presumably refined at Dr. MacLane's insistence. In a related activity, in 1978 Dr. MacLane reported to the Board on his attendance at a symposium sponsored by the Social Science Research Council critiquing *Science Indicators 1976*. Dr. MacLane also represented the Board at several other meetings on this subject—one held at the Organization for Economic Cooperation and Development in Paris in September 1980.

3. Use of Consultants and External Groups to Prepare Reports

Information provided by NSF staff indicates that, during the early 1970s, the NSB prepared reports itself, or with in-house NSF staff, with the assistance of a consultant or guidance from relevant advisory committee members. Now the procedures have shifted to a policy by which the Board (using the support services of NSF staff) contracts out for the preparation of reports, or as is the case with *Science Indicators*, uses NSF staff to prepare reports. The costs of preparing such reports have risen at about the rate of inflation. (See Table 14.) Preparation of the twelfth report, tentatively entitled Science and Society, has required the use of three kinds of contracts: a coordinator to assist in overseeing production of the report for the chairman of the committee at his home institution, especially to help identify the case studies to be included; a consultant to examine the feasibility of including the case studies and limiting them in number; and other experts to write the case studies to be included in the report.[35]

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[31] CS :189 :6.
[32] ES : 204.
[33] CS : 189 : 7.
[34] CS :198 :5.
[35] Interview with NSF staff member.

TABLE 14.—NATIONAL SCIENCE BOARD ANNUAL REPORT COSTS, JULY 16, 1980

Year	Report	Amount	Length (pages)	Consultants	Contractors
1969	Toward a Public Policy for Graduate Education in the Sciences	$149, 134	63	Yes	
	Graduate Education—Parameters for Public Policy (NSB–69–2)		168	----	
1970	The Physical Sciences	171, 128	61	Yes	
1971	Environmental Science—Challenge for the Seventies	155, 000	46	Yes	
	Patterns and Perspective in Environmental Science (NSB–73–2)				
1972	The Role of Engineers and Scientists in a National Policy for Technology.	157, 429	47	Yes	
1973	Science Indicators—1972	365, 046	145	----	
1974	Science and The Challenges Ahead	175, 000	56	----	
1975	Science Indicators—1974	480, 000	242	Yes	
1976	Science at the Bicentennial	190, 000	154	----	
1977	Science Indicators—1976	576, 000	304	Yes	
1978	Basic Research in the Mission Agencies	195, 000	405	Yes	
1979	Science Indicators—1978	[1] 550, 000	263	Yes	Yes.
1980	The Twelfth NSB Report [Science and Society]	[2] 289, 156		Yes	Yes.
1981	Sciences Indicators—1980	n. a.		Yes	Yes.
1982	Unversity—Industry Relationships	[3] 250, 000		Yes	Yes.

[1] Cost for Science Indicators—1978 reflect the omission of a public attitudes chapter from the report.
[2] To date.
[3] As of August 1980.

Note: all costs are estimated and include personnel, contracts, printing, and other expenses.

Source: Information provided by NSF; subsequent analysis prepared by CRS.

D. Reactions to Board Reports

The topic of appropriate timing and subjects for the Board's reports still seems to be an unresolved issue. Utilization of such reports is a critical factor in determining the future of the annual report requirement. The reports are unique because they carry the weight and stamp of the NSB. They also are unique to the extent that they deal with issues affecting NSF that might be too controversial for the directorates, especially STIA, and for the Director to handle. For instance, it could be claimed that data in *Science Indicators* could be used to support arguments for NSF investing more in particular disciplines that now might be considered by some to be underfunded.

The actual use of NSF reports is still subject to evaluation. The reports are hardly ever mentioned or invoked by the Board in its policy discussions at Board meetings. Similarly the discussions of Board committees which most appropriately would deal with the topics of Board reports do not appear to refer to these reports. Board discussions indicate that some of the Board members have some reservations about the utility of the reports in relation to the time required to write them. As a result, the Board has continued to seek to better define its annual report writing function and timing.

1. NSB request to Modify Legislation to Make Report Requirement Discretionary

In 1979, at meeting 206 the chairmen of the committees for the eleventh and thirteenth Board reports meet with the Director to discuss the schedule and cycle for Board reports. The Board reported that it favored a reporting system for producing *Science Indicators* reports in odd-numbered years and "reports . . . contain[ing] narrative documentation of scientific progress" in even-numbered years. The Director, however, favored a three-year cycle as opposed to a biennial cycle for *Science Indicators* reports.[36]

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[36] CS: 206: 6.

During the closed session of the 213th meeting in February 1980, the Board adopted a resolution (80–22) to seek OSTP and OMB guidance regarding its goal of amending Section 4(j) of the NSF Act to:

> (1) Remove the requirement that the Board render annual reports to the President for submission to the Congress;
>
> (2) Direct the Board to render reports to the President for submission to the Congress as it or the President determine the need for such reports; and
>
> (3) Direct the Board to submit *Science Indicator* reports once every three years.[37]

The Board wanted this language to be included in the draft of the NSF authorization bill. Subsequently the Director and NSF General Counsel, apparently not wanting to divest the Foundation of any of its authority, recommended language giving the Board, rather than the President, authority to determine when a report should be made:

> The Board shall render to the President, for submission to the Congress every three years, beginning on September 30, 1981, a report on indicators of the state of science in the United States. In addition, the Board shall render to the President, for submission to the Congress, other reports on policy matters related to science, engineering, and science education, as the Board or the President determines the need for such reports.[38]

The Senate version of the fiscal year 1981 authorization bill contained language that would have required the submission of biennial substantive reports, alternating with *Science Indicators* reports, but the House version did not contain a comparable provision and, as a result, the conferees declined to include the Senate provisions in the bill as reported and passed.[39]

E. OBSERVATIONS

In view of the Board's own complaints about spending excessive amounts of time writing reports, it seem prudent that any consideration of future Board report requirements look also at the other report-writing responsibilities placed upon NSF and the nature of the Board's response to them, with a view toward ensuring that the Board's time and attention are not misused. Such discussions might consider whether or not there is a natural complementarity or opportunity for cross-fertilization between the NSB *Science Indicators* report and the two OSTP reports that NSF is required to prepare (the annual one-year review and the Five-year Outlook). Also it might be determined whether the Board should continue to be required to write separate annual reports of its own or whether the Board's responsibilities to report to the Congress might be satisfied better by preparing an introductory or overview statement for the OSTP-related reports. Other questions are relevant. For instance, a critical factor is whether or not the uniqueness of NSB annual reports should be determined by the nature of the Board's responsibility as the governing Board of the NSF or whether their uniqueness should relate to the fact that the NSB is a "national science board" in the broad sense of the concept. The Board's uniqueness, if defined only in the first sense, naturally would limit the Board's report-writing functions to deal exclusively with issues of NSF policy, for instance, issues of the health of academic science or issues related to implementation of controversial NSF policies which could not be adequately or impartially addressed by the NSF Director or any policy research group within NSF. Should agreement be reached that the Board's responsibility is truly "national" in scope, the Board's authority and report-writing responsibilities could be interpreted to deal with broad issues of national science policy, transcending the boundaries of the National Science Foundation. However, the appropriateness of attributing a broader scope to the NSB reports would depend in part on several other factors, for example, whether or not the science adviser and the OSTP wanted the NSB to play such a broader role and whether or not the public and other agencies were receptive to such a role—probably a tenuous possibility considering that the Foundation is an independent agency whose budget constitutes only one-thirtieth of the total Federal funding for research and development and whose Director does not hold cabinet status. Attributing a broader perspective to the Board's "national science policy" responsibilities also implies that the Board should address issues of the use of science and technology for national policymaking or problem-solving. How would problems be chosen? What resources does the Board have to study them? Who would be the targeted audience for such reports? Would the Board be able to withstand the inevitable criticism or opposition to its solutions? What effects would such criticism have on NSF? Would the statute governing NSF need to be changed to give the Board a broader report-writing role?

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[37] Memorandum to Members of the National Science Board. Preliminary Report on February [1980] Board Meeting. Feb. 23, 1980, pp. 4–5. (NSB–80–103.)

[38] CS : 213 : 11.

[39] U.S. Congress. House. Committee on Conference. National Science Foundation Authorization and Equal Opportunities in Science and Technology. Conference Report to accompany S. 568. Nov. 21, 1980. Washington, U.S. Govt. Print Off., 1980. p. 16. Report No. 96–1474.

F. Need for a Compilation of NSB Policies and Procedures

Consideration might also be given to the issue of requiring the NSB to prepare an annual report or compilation of all NSB policies and procedures recommended or authorized during the preceding year. Appendix B to this report contains a compilation of all major NSB policy and procedural decisions and statements made since 1968. Over the last few years, various Board-related groups have recommended that the Board or NSF staff collect and publish all substantive and procedural policy statements made by the Board in an effort to better document Board-enunciated policies. Former NSF General Counsel William Hoff made this recommendation in his 1976 report which reviewed Director and Board functions and relationships. The Board's own PPC Subcommittee on External Mechanisms also made a similar recommendation. These attempts have not met with success, however, because NSF staff say that NSB policy statements take many different forms. The present General Counsel recommended that the NSF "Program Manager's Manual" (which in some respects reflects the administrative interpretation of NSF policy statements) could serve as an accurate public representation of NSB policy statements.

Recommendations for collecting policy statements, including those which are not given resolution numbers, seem to warrant attention, since now it is difficult to identify NSB policy statements and to determine actions taken by NSF and others to implement the policies enunciated. The NSB might be encouraged to collect and publish annually all types of policy statements and resolutions so that NSF staff, Congress, and others can become fully informed about what policies NSB adopts annually. According to former PPC Chairman William Hubbard, the statute governing the Board of Regents of the National Library of Medicine may serve as a useful precedent. That statute requires the Secretary (of Health and Human Services) to make an annual report to the Congress regarding the activities of the Board of Regents, including ". . . a statement covering the recommendations made by the Board and the disposition thereof."[40] Were such a compilation to be required for the Board of the National Science Foundation, Congress might be better able to oversee the work of the NSF. However, there may be disadvantages to such a proposal. For example, such a recommendation might engender undesirable inflexibility on Board procedures and discussion topics, and compromise the creativity of the Board as a whole and the contribution of individual members.

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[40] 42 USC 277(b).

IX. NATIONAL SCIENCE POLICY-RELATED ACTIVITIES OF THE NSB: 1969–1980

The passage of Public Law 90–407 in 1968 amended the National Science Foundation Act of 1950 to specify that "The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." While the formulation of such national policies was not intended to be the Board's primary function, the enactment of Public Law 90–407 made it clear that Congress viewed NSB's national science policy advisory role to be quite important.[1] This chapter will focus on the Board's major activities related to its national science policy advisory function during the period 1969 through 1980. Activities covered include the development of annual reports, Board interactions with the President and with White House and other executive branch representatives involved in science policy development, the Board's science advisory support role during parts of the Nixon and Ford Administrations, and the promulgation of certain Board resolutions touching on national science policy issues.

A. NSB Annual Reports

Public Law 90–407 assigned to the Board the function of rendering an annual report to the President for submission to the Congress on the status and health of science and its various disciplines. This new function provided the Board with the opportunity of addressing various national science policy issues in a potentially influential forum. (See chapter VIII for a summary of reports.) The national science policy recommendations contained in the Board's 11 annual reports have been one source of potential advisory inputs to the Executive Branch's agenda for science and technology. The Board has recommended in most of its topical annual reports, that increases be made in Federal expenditures and incentives for research and development and particularly for basic research. This may have had some impact on the formulation of national science policy under the Ford and Carter Administrations, since annual Federal obligations (in constant dollars) for basic research have increased since 1975, reversing a downward trend in effect since 1968.[2]

Statistical information and trend analyses presented in the *Science Indicators* reports have provided Executive Branch policymaking bodies, such as the Office of Science and Technology Policy and the Office of Management and Budget, with historical trend data useful as a decisionmaking tool for science and technology. This has done much to place the Board in a prominent position among advisory bodies with input into national science policy decisions.[3] Indeed, the

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[1] See chapter II.

[2] U.S. National Science Board. Science Indicators 1978. Washington, U.S. Govt. Print. Off., 1979. p. 66.

[3] Interviews with Phillip Smith, OSTP, and Dr. Norman Hackerman, former Chairman, NSB.

Science Indicators report series was a Board-originated idea intended partly to enable the Board to emerge as a prominent voice for the articulation of national science policy.[4] (See chapter VIII.)

B. NATIONAL SCIENCE POLICY AND THE SUPPORT OF U.S. SCIENCE INFRASTRUCTURE, 1968–74

Among the Board actions immediately following the enactment of Public Law 90–407 in 1968 was the reorganization of the Board's committee structure.[5] The new committee structure included three "policy committees," one of which was the Long-Range Planning Committee. This committee was directed to devote its attention to long-range science problems bearing on such considerations as:

—National needs of the country and the role to be played by the Federal Government;
—Any changes in the proposed role of the Foundation in the Federal Government encompassing substantive as well as organizational issues (e.g., the future organizational niche of the Foundation);
—Levels of support for science and the forms that support should take; and
—Identification of national policy issues which the Board should study and make pronouncements upon through annual reports or otherwise.

The Board's committee structure was once again reorganized in 1971 to free the Board of routine matters so that it can devote more time to the consideration of major policy issues.[6] In the revised committee structure there was established a Planning and Policy Committee assigned to:

—Identify national science policy issues;
—Designate those policy issues to be considered by the Board;
—Consider all policy issues solicited by the Board, including budgetary matters, and prepare draft documents for subsequent Board discussion;
—Prepare draft "white papers" on principal issues of the day under Board consideration;
—Articulate the goals for science and science education within the framework of the Nation's goals; and
—Consider national needs and the proper roles of the Federal Government, in general, and the Foundation in particular.

The Long-Range Planning Committee and later the Planning and Policy Committee were assigned national science policy functions. However, the Board also used other mechanisms to identify such issues. National issues were at times presented to the Board via the Director's staff, the Executive Office of the President (including OMB, OSTP, PSAC, and the President's Science Advisor), external events or publications, and suggestions from concerned members of the scientific community. These extra-NSB avenues were particularly important during the period in which NSF Director Dr. H. Guyford Stever served as science advisor to Presidents Nixon and Ford. The remainder of this chapter will discuss the activities of the Long-Range and Planning and Policy committees, but the focus will be on examples of the accomplishments of the full Board rather than on the activities of these particular Board committees. For an in-depth review of the activities of the Board's Policy and Planning Committee see chapter VI.

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[4] Interview with an official of OSTP. Cf also NSB: ES: 133: 2–3, Nov. 19–20, 1970, and ES: 138: 15, Apr. 15–16, 1971; and testimony of Dr. R. W. Heyns, former NSB member, in U.S. Congress. House. Committee on Science and Technology. Subcommittee on Domestic and International Scientific Planning and Analysis. Measuring and Evaluating the Results of Federally Supported Research and Development: Science Output Indicators—Part I (Special Oversight Hearings). Hearings, 94th Congress, 2d session, May 19 and 26, 1976. Washington, U.S. Govt. Print. Off., 1976. p. 10.

[5] 120: 3, 13–15.

[6] ES: 139: 11, and ES: 140: 16, 30–32.

1. *Interaction Between NSB and President Nixon: Federal Science Funding and Organization*

Among examples of NSB input into national science policy decisionmaking are those cases of direct communication between the Board and the President on science and technology issues. On January 21, 1969, NSB Chairman Philip Handler transmitted to President Nixon a Board statement entitled, "American Science and the National Science Foundation: Statement by the National Science Board" (Jan. 21, 1969). This statement addressed four major concerns of the Board and set forth corresponding recommendations, summarized below:

> On Instability of Federal Support of Research and Graduate Education: The implicit Federal policy of support for academic science and graduate education should be made explicit, with a resumption of steady growth in Federal science support of which NSF obligations should constitute one-third within a few years. A supplemental appropriation for NSF should be sought for the balance of fiscal years 1969, along with increased expenditure levels for fiscal year 1969 and fiscal year 1970.
>
> On Need for Rigorous, Rational Bases for Long-Range Solutions for Domestic Problems: The Administration should support NSF in seeking Congressional authorizations and appropriations to strengthen social science research and to develop academic multidisciplinary research institutes in order to assist the resolution of pressing national problems.
>
> On Need to Educate Scientists and Technicians in Undeveloped Nations: NSF should be designated, and funded accordingly, as the prime Federal agency for improvement of science and engineering education in developing nations.
>
> Organization of the Federal Government for the Support and Conduct of Fundamental Research: Currently under NSB study; recommendations to be made in 1969.

President Nixon responded to some of the Board's recommendations. NSF promptly received a $10 million increase in its expenditure ceiling for fiscal year 1969, but mainly for the Administration-inspired applied interdisciplinary research program which began in December 1969 and which grew into the Research Applied to National Needs (RANN) Program. President Nixon also agreed to meet with the Board to discuss the concerns addressed in its statement.[7]

The fourth area of concern listed in the Board's January 1969 statement to the President was subsequently addressed by Congress and the Office of the President. In July 1969, Dr. Handler, then NSB Chairman, testified before a House subcommittee during hearings on the centralization of Federal science activities.[8] At about this time, the President's Advisory Council on Executive Organizations requested the views of the Board on the organization of the Federal scientific effort.[9] In response to that request a draft discussion paper, entitled "Department of Research (or Science) and Graduate (or Advanced) Education," was prepared by the Board's Long-Range Planning Committee. The paper proposed a new Cabinet-level department consolidating the major scientific agencies with the responsibility for science research or graduate education. In January 1970 the Board agreed to transmit a revised form of its proposal for the establishment of a new Federal agency for the support of Federal research, graduate and post-graduate education, and the early stages of certain areas of applied research.[10] In its letter to the President accompanying its proposal, the Board recommended the centralization of Federal science activities (but not to the exclusion of related activities within mission agencies) as: "an appropriate means for central articulation of national science policy; stabilization and orderly growth of our research-performing educational institutions; and a balanced, vigorous national research program, funded in its own right and on its own merits, divorced from the vicissitudes of separate appropriations to a multitude of Federal agencies."[11]

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[7] ES: 123: 1–12.

The Board's recommendation was related to another matter it considered at that time—the ramifications of Section 203 of the Military Procurement Authorization Act, Public Law 91-121 (the so-called Mansfield Amendment).[12] The Board considered and took exception to the intrinsic philosophy of the Mansfield Amendment, emphasizing in its letter to the President its support of "the pluralistic pattern of conduct and support of research in support of their missions by science-using Federal agencies."[13]

In March 1970 the Board again transmitted a letter to the President,[14] petitioning for increased NSF budgets for fiscal year 1971 in the areas of graduate traineeships and research funding. The plans were supported on the basis of national science policy considerations, including the support of graduate science education as a means of maintaining national research infrastructure, the geographic distribution of graduate education activity, and the balanced support of scientific research (particularly as affected by the Mansfield Amendment).

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[8] U.S. Congress. House Committee on Science and Astronautics. Subcommittee on Science, Research, and Development. Centralization of Federal Science Activities. Hearings, 91st Congress, 1st session, July 10, 22–24, 28–31, Oct. 7, 9, 1969. Washington, U.S. Govt. Print. Off., 1969. p. 192 ff.

[9] ES : 126 : 3.

[10] ES : 129 : 2, 26–27.

[11] ES : 129 : 26.

[12] 83 Stat. 206. Section 203 required that "None of the funds authorized to be appropriated by this Act may be used to carry out any research project or study unless such project or study has a direct and apparent relationship to a specific mission military function." This section was repealed during the 2d session of the 91st Congress with the enactment of Section 204 of Public Law 91–441 (84 Stat. 905), which required that "None of the funds authorized to be appropriated to the Department of Defense by this or any other Act may be used to finance any research project or study unless such project or study has, in the opinion of the Secretary of Defense, a potential relationship to a military function or operation." The latter requirement is still in effect. It is noteworthy that Section 205 of Public Law 91–441 stated "that sense of Congress that . . . a larger share of [increased Government support of basic scientific research] should be provided hereafter through the National Science Foundation."

[13] NSB : ES : 129 : 8–9; Jan. 18–19, 1970 (letter dated Jan. 22, 1970). The Board subsequently (a) adopted a resolution encouraging the Federal mission agencies to maintain strong basic research programs in areas that have the potential of contributing to their missions over the long term (October 1974), and (b) devoted one of its annual reports to the topic of basic research in the mission agencies (1978).

[14] ES : 130 : 11–15, (letter dated March 27, 1970).

2. NSB Initiation of Science Indicators Report Series

At its 133rd meeting in November 1970, the Board considered its future roles, responsibilities, and activities. For this purpose it reviewed a paper drafted by the Director and the staff at the request of the Chairman which discussed Board operation and functions, and agreed that:

> As select representatives of scientific leaders in the Nation [the Board] should: play a more significant role in formulating national science policy . . . and reconsider the nature of the Board's annual report to the Congress. . . . The Director agreed that, since the National Science Board is the only group by statute representing the scientific and educational communities at the policy-making level of the Federal Government, the Board should take more initiative in the formulation of national science policy and in interacting with the President's Science Adviser.[15]

At this meeting the Board formally agreed that it would undertake the development of an annual report on the status and health of science as proposed by NSB Vice Chairman, Dr. R. W. Heyns. This action resulted in an effort leading to the *Science Indicator* series, beginning with *Science Indicators 1972* (issued 1973) (See chapter VIII).

3. NSB Policies for the Support of U.S. Academic Research

The Board again focused on Federal support of the U.S. academic research infrastructure at its 135th meeting in January 1971. In a policy statement approved unanimously at that meeting, the Board spelled out an NSF policy of revived attention, concern, and planning energy regarding science education, manpower, facilities, and institutions. (OMB had forced NSF to terminate its institutional support program when RANN began.) The Board also committed itself to "lend what weight it has to the concept that Federal support of institutions of higher education on a major scale is critically necessary, and necessary now." Finally, the Board policy statement declared that:

> The National Science Board should have five-year and ten-year goals. Whatever the year-to-year battles (with victories and losses) with a given administration or a given staff of Office of Management and Budget or a given set of Congressional committees, it should:
>
> (a) be continuously able to graph in specific ways those year-to-year results against a longer stretch of objectives and programs; and
>
> (b) allocate a regular part of its attention and energy toward the accomplishment and attainment of its forward vision several years ahead.[16]

As a way to implement these policies, the Board considered the possibility of joint meetings between OMB staff and NSB which would highlight the position of the scientific and educational communities on policy matters of mutual interest.[17]

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[15] ES : 133 : 2–3.
[16] 135 : 130, Jan. 21–22, 1971.
[17] ES : 142 : 11

Science education policy was again considered in detail by the Board at its 153rd meeting in February 1973.[18] At this meeting a review of educational policy questions and policy resolutions proposed by one Board member led to the consideration of four resolutions proposed by the Board's Ad Hoc Committee on Science Education. At its next meeting, the NSB adopted the proposed resolutions with slight modifications as objectives for NSF's Science Education programs. The objectives were: development of exceptionally high-quality doctoral and postdoctoral programs, strengthened connection between outstanding research and science education, focus on (a) monitoring and increasing scientific literary, (b) educational improvement through science and technology, (c) monitoring science manpower needs, and (d) training which prepares scientists and engineers to contribute to the solution of national problems, and reduction of educational barriers to the recruitment and development of talent in science and technology, particularly regarding science education for women and disadvantaged minorities.

The Board voted to endorse these policy recommendations, but later that same meeting rescinded the vote, on the grounds that an insufficient number of members was present, science education needed to be related to the total NSF mission, the issue of minorities and women needed to be addressed, and the Board should give more attention to the issues before adopting a policy statement on them. (See chapter XVII.)

Board efforts directed at U.S. science infrastructure problems continued in 1973 through the activities of Task Force 1 of the Board's Planning and Policy Committee. In June 1973, Task Force 1 reported to the full Board on its detailed consideration of demographic and employment issues relating to research personnel.[19] The Task Force's recommendations, which the Board generally agreed with, focused on the need for the Board to assume responsibility for the preparation of a thorough report on scientific manpower, reiterating one of the themes of the policy objectives outlined by the Board in March 1973.

The Board's general directives in the area of science manpower information were implemented in part through the formation of an ad hoc Board subcommittee on the subject and through the Board's *Science Indicators* series begun in 1973. The topic of science manpower was specifically addressed by the Ad Hoc Subcommittee on Manpower in its special 1974 report, "Scientific and Technical Manpower Projections." [20]

C. Science Advice During the Nixon Administration, 1973–1974

Due to unique circumstances in effect during the period 1973 through 1976, the National Science Foundation was in a strong position to influence the formulation of national science policy. These circumstances arose from a decision by President Nixon early in his second term to substantially change the White House science advisory apparatus. Early in January 1973, Dr. H. Guyford Stever, then Director of NSF, was asked to attend a meeting with the Secretary of the

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[18] ES: 153: 1, 15–20.

[19] 157: 17–22.

[20] National Science Board. Planning and Policy Committee. Ad Hoc Subcommittee on Manpower. Scientific and Technical Manpower Projections, NSB–74–286. Washington, U.S. Govt. Print. Off., October 1974. 69 p.

Treasury and Special Assistant to the President, and the Director of OMB, concerning what NSF's new responsibilities might be in light of an upcoming executive reorganization. Dr. Stever was not asked to invite the other members of the National Science Board to this meeting or to involve the Board in developing ideas in response to this meeting.[21] Shortly thereafter, on January 26, 1973, President Nixon released Reorganization Plan No. 1 of 1973. The reorganization abolished the President's Science Advisory Committee (PSAC) (when the President accepted the resignations of PSAC members and made no new appointments) and the Office of Science and Technology (OST) and transferred all of OST's functions to the NSF Director, effective July 1, 1973. It is alleged that the President's actions were precipitated by his disagreement with the public statements made by some PSAC members and by the general lack of rapport and communication between the White House and the scientific advisors.

Prior to the release of Reorganization Plan No. 1, on January 3, 1973, Dr. Edward E. David announced his resignation as Science Adviser to President Nixon. When the President subsequently announced his reorganization plan, he made it clear that he intended to appoint Dr. Stever to the additional role of Science Adviser to the President. On July 10, 1973, Dr. Stever was appointed as Science Adviser and Chairman of the Federal Council for Science and Technology. Dr. Stever continued in these capacities—while simultaneously serving as Director of NSF—through most of President Ford's Administration.

1. *Enhanced NSB Science Policy Role: the National Science Policy Subcommittee*

The Board had access to the President's Science Advisers prior to Reorganization Plan No. 1.[22] But subsequent to the reorganization, the Board was placed in the peculiar situation of being responsible for NSF policy at the same time that NSF's Director, serving as an ex officio member of the Board, was responsible for delivering science policy advice to the White House. The Director clearly had been given the primary science policy role by President Nixon and, on July 2, 1973, Dr. Stever established a Science and Technology Policy Office (STPO) within NSF to assist him in carrying out his new functions. However, at about the time of Dr. Stever's appointment as Science Adviser, the NSB Chairman, who was at that time Dr. Herbert E. Carter, recommended that the Board as a whole should develop a method of providing greater impact on national science policy matters on which it had special concern or competence by designing a more effective procedure for identifying and considering such issues and disseminating its views to the public.[23] The task of developing these new procedures was assigned to the Board's Planning and Policy Committee. At the Board's next meeting, the Chairman created as part of the Planning and Policy Committee a National Science Policy (NSP) Subcommittee, to be chaired by Dr. T. Marshall Hahn, Jr., with a charter to identify national science policy issues on which the Board had some competence and to recommend the manner and nature of related studies.[24] During its first meeting, the NSP Subcommittee developed the following initial list of subjects to be considered:

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[21] Stever, H. Guyford. Science Advice—Out of and Back Into the White House. Technology in Society, v. 2. 1980 : 67. (Hereafter referred to as Science Advice.)

[22] See, for example, ES : 145 : 24. Dr. David met with the Executive Committee to discuss the fiscal year 1973 budget and NSF's role in the support of research and education. See also Stever, op. cit., p. 66.

[23] ES :157 : 6.

> Role of the Board in relation to changes in the Federal science structure, especially as it relates to science policy issues; [to be discussed with the Director];
> Optimum performer base;
> Policy for science education; and
> Federal role with respect to industrial innovation.[25]

STPO, in the meantime, had developed its own strategy and had begun operations in accordance with a set of major responsibilities which were reported as the following: [26]

> Provide advice, consultation, and recomendations on national civilian science and technology policy;
> Develop technical options related to the solution of national problems in the civilian area;
> Appraise the overall effectiveness of ongoing Federal and national R&D efforts and recommend policy and program action toward the achievement of national goals through civilian science and technology;
> Serve as the focal point for coordinating Federal R&D programs (STPO will provide staff support for the Federal Council for Science and Technology and assist the Director in the formulation and coordination of Council activities);
> Interact with academic and industrial scientific communities on broad matters of science policy so as to further their participation, in every appropriate way, in strengthening science and technology in the United States; and
> Provide advice and assistance in furthering U.S. international science and technology objectives.

At that time, STPO also announced to the Board that it had arranged a meeting between the Director and representatives of the scientific societies and another meeting between the Director and representatives of industry and technical societies. The Director began to report regularly such activities, as well as those he performed as Science Adviser, to the Board at its monthly meetings.

2. Clarification of NSB's New Science Policy Role

As it had planned in October 1973, the Board, and the NSP Subcommittee in particular, quickly sought to define its responsibilities in the context of the Director's enlarged role in national science policy matters. At the Board's November meeting, the Chairman of the NSP Subcommittee presented a progress report on his recent conversations with the Director during which certain agreements were reached concerning how the Subcommittee could assist the Director as Science Adviser. Specifically, it was agreed that (1) the Board would serve as an early warning system to the Science Adviser to identify issues which might emerge as national science policy questions, and (2) the Subcommittee would serve as a body available to the Science Adviser for informal and confidential consultation.[27] At the same meeting the Board's Executive Committee expressed concern about the Director's expanded responsibilities in light of his science advisory activities and urged him to add senior scientific staff to his immediate staff.[28]

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[24] 158 : 11–3.
[25] 158 : 12–18.
[26] ES :158 : 5–6.
[27] 160 :5, ES :160 : 8.

3. NSB Recommends Policies Regarding Federal Health Regulation

At its second meeting in February 1974 the NSP Subcommittee considered, upon referral from the Board, the report "Chemicals and Health," prepared by STPO with substantial input from the Chemicals and Health Panel of the President's Science Advisory Committee.[29] After reviewing the report to identify possible areas of action for recommendation to the Science Adviser and the Foundation, the NSP Subcommittee proposed a series of recommendations which the full Board adopted unanimously. The recommendations were that:

> The Science Adviser pursue policies which would result in issuance of regulations by the various health-related regulatory agencies based on adequate knowledge and understanding, emphasizing an appropriate balance of benefits and risks, encouraging development of multiple options, and avoiding unsound scientific approaches.
>
> —The Science Adviser seek the establishment of a requirement that the chief administrator of each health-related regulatory agency have an Advisory Board of Review, consisting of members from outside the Government, that would advise on each important regulatory decision.
>
> —The Science Adviser seek the establishment of a requirement that each health-related regulatory agency issue a white paper to provide a technology assessment and an analysis of probable benefits and risks in connection with any proposed new regulation.
>
> —The Science Adviser continue to follow up with the health-related regulatory agencies and seek a specific response to each recommendation contained in the report.
>
> —The National Science Foundation provide expanded educational and science information activities to generate greater interest of the broad scientific community in health-related problems and to increase public understanding of the need for adequate scientific base and benefit-risk analysis in regulatory decisions.[30]

These recommendations paralleled those set forth in the PSAC report and reflected the Board's approval of the policy recommendations developed through the PSAC–STPO effort. At that time the NSP Subcommittee also reported to the Board its plans to review several reports prepared by the National Academy of Sciences on materials research and to offer to the Board recommendations for action by the Science Adviser and the Foundation.[31]

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[28] ES :160 : 16.

[29] National Science Foundation. Science and Technology Policy Office. Chemicals and Health : Report of the Panel on Chemicals and Health of the President's Science Advisory Committee. Washington, U.S. Govt. Print. Off., Sept. 1973. 211 p. This report was the product of almost two years of PSAC deliberation and review by concerned agencies. The report directed at the managers of the Federal health and safety regulatory apparatus offered 21 general recommendations and 53 detailed recommendations addressing, inter alia, (1) better balance in regulatory actions, (2) regulatory responsibility to stimulate product development consistent with safety, (3) the role of the National Institute of Environmental Health Sciences, (4) research needs, (5) regulatory precautions, (6) encouragement of product diversity, and (7) communicating the results and meaning of recent scientific findings.

[30] ES :162 :8–9.

[31] Ibid., p. 9.

D. Science Advice and Science Policy Organization During the Ford Administration, 1974–76

The Board's National Science Policy Subcommittee did not reconvene after its February 1974 meeting, but rather subsequently was upgraded into a full Board committee, called the Committee on National Science Policy, chaired by Dr. Frank Press.[32]

1. Dr. Press Meets With President Ford

At the February 1974 meeting, Dr. Stever reported to the Board on a meeting he had earlier with President Ford at which, among other issues, the roles of NSF and the National Science Board were discussed. The President, Dr. Stever reported, raised the subject of science advice and various alternative mechanisms to strengthen that advice either through the Domestic Council, other White House organizational elements, or under the existing arrangement. Two months later, Dr. Stever, as Science Adviser, "expressed a desire to keep in closer contact with the Committee on National Science Policy to discuss informally major issues as they arise and thus to keep the Board informed of developments." Dr. Press agreed to convene the NSP Committee soon and to "meet as often as necessary to fulfill its advisory role to Dr. Stever."[33]

2. The Board Advises on Science Policy Organization

On December 21, 1974, President Ford asked Vice President Nelson Rockefeller to study whether the system of a White House Science Adviser should be revived and, if so, in what form. The Vice President was requested to review all suggestions regarding science advisory mechanisms and report back to the President around the end of January.[33a] In light of the President's request, the NSB Chairman suggested at the meeting in January 1975 that the Board consider its proper role in taking a position on the science advisory mechanism at the presidential level.[34] The Director pointed out that he was taking a neutral position on alternative science advisory proposals and that "as long as he had the responsibility as the President's Science Adviser he would fulfill the tasks to the best of his ability with the resources he had available to him in the Foundation."[35]

In executive session the Board discussed such issues as: the need for national science policy advice to include consideration of military R&D, and the increased influence of OMB in Executive branch science policy decisionmaking. He also cautioned that the Board might not be able to give national science policy functions the time required:

> Dr. Press stated that the National Science Board as now structured could not function as effectively and broadly as PSAC. He noted that when he served on PSAC he worked at his numerous important assignments approximately ten days a month and that he traveled 200,000 miles alone during his first year of service. A *major* commitment of time and effort would be required if the

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[32] ES :162 :38.

[33] ES :168 :4.

[33a] President Ford apparently already had decided that he wanted to reestablish the White House science structure on somewhat the same lines it had followed before, but he wanted this re-establishment to be a matter of legislative action as opposed to a reorganizational directive from the President. This was expressed to Dr. Stever during a meeting he had with the President on October 17, 1974. Vice President Rockefeller's consideration of this issue was delayed several months. See Stever, op. cit., p. 62–63.

[34] ES :169 :11–12.

[35] Ibid., p. 11.

> Board is to discharge a science policy role comparable to that of PSAC. To fulfill this larger role would be difficult if at the same time the Board discharged its statutory duties as the policy making body of the Foundation.[36]

The Board concluded that the best possible science advice should be introduced at the highest levels of the Federal Government and requested that the new NSP Committee investigate the matter further.

The Chairman of the Board transmitted a letter to President Ford on January 24, 1975 requesting a meeting with him on behalf of the Board. Among other things, the letter mentioned that:

> The Board is seeking ways to enhance its contribution to the support of the national programs aimed at the solution of the major problems of today . . . the economy . . . [and] other serious challenges, some of which underlie and foster the economic problem. . . . Science and technology, by themselves, cannot solve any of these complex technical-economic-social problems; but as part of a broader commitment and larger strategy, they can play a pivotal role in helping to alleviate many of the problems.[37]

The Chairman's letter to the President was followed on January 31 with a letter to the Vice President concerning the Board's position on a science advisory mechanism for the White House. Initially prepared by the NSP Committee, the letter endorsed no specific science advisory organization, but recommended rather that the structure finally selected be fully integrated into the essential stages of decisionmaking bearing on national science policy:

> [A] President's personal style in organizing and dealing with his staff is more important than the specific structure of the science advisory apparatus in the White House.
>
> . . . We believe that a science adviser can serve a President best if he is directly involved in the early stages of problem definition and information gathering as well as the later stages of analysis, the examination of options, and the recommendation of possible courses of action. . . .
>
> Rather than detailing a particular structure, we suggest that whatever science advisory apparatus is selected, the science adviser (or advisers) should be an active participant in the deliberations of the Domestic Council, the National Security Council, and the Energy Council. The adviser's office should also be charged to formulate science policy for the Executive Branch, to evaluate agency R&D programs, and to participate in decisions leading to the allocation of resources for science and technology.[38]

The draft of the letter to the Vice President had been submitted to all Members and their comments elicited, but, due to time constraints, no Board interaction had been possible.[39]

At the Board's next meeting in February, both letters were discussed and the NSP Committee was directed to prepare an agenda for the requested meeting with the President.[40]

At the Board's February meeting the NSP Committee convened for its second meeting, during which Dr. Stever was asked to discuss the status of the Vice President's review of the science policy organization for the Ford Administration and present his views on the matter.[41] Dr. Stever reported that he and his staff turned over a considerable amount of information to the Vice President and that an options paper had been prepared which he had not been involved with because of his policy not to take a position on the matter.

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[36] Ibid., p. 12.

[37] ES :170, appendix B, Feb. 21, 1975.

[38] 170 :38–40.

[39] See ibid., p. 24. The majority of members' comments had been taken into account in the final copy, and all but two Members had agreed to its dispatch.

[40] Ibid., p. 23–24, 28–29.

3. Board Consideration of Science Policy Legislation and Future Agenda Items

At the February 1975 meeting, Dr. Stever also observed that a question of growing importance was how to handle the growing pressure on NSF to become heavily involved in R&D at the State and local level, as proposed in Senator Edward Kennedy's bill, S. 32. Senator Kennedy introduced S. 32 originally on January 25, 1971, as the Conversion, Research, Education and Assistance Act, after hearings in the 91st Congress on the general topic of problems involving post-Viet Nam war economic conversion.[42] After further hearings and amendments, the Senate Committee on Labor and Public Welfare reported S. 32, the National Science Policy and Priorities Act of 1972, to the Senate on June 28, 1972, and it was passed by the Senate on August 17.

In September 1972, the Board had considered S. 32, as passed by the Senate, and had reached a number of detailed, tentative conclusions which were generally supportive of three of the bill's four titles relating to (I) science policy and priorities for civilian research and engineering, (III) transition of technical manpower to civilian programs, and (IV) protection of pension rights of scientists and engineers.[43] The PPC objected to title II, which would have created a Civil Science System, since NSF was already implementing the Research Applied to National Needs (RANN) program, with objectives that were similar to those of title II of S. 32.[44] Of particular concern to the Board were those aspects of titles II and III of the bill that would significantly enhance the applied science activities of NSF, which the Board viewed as a secondary mission:

> Whatever the future may bring, the Board and the Director must remain ever mindful of the unique mission of the Foundation—the strength and scope of the national effort in fundamental scientific research and assurance that there is always, in training, a next generation of scientists being adequately prepared to accept their roles in the scientific endeavor. For the Foundation, all else must remain secondary.[45]

The Board again considered S. 32 after its reintroduction in the 93rd Congress along with a number of more or less similar bills. This time the Board discussion focused on Title II of S. 32, the Civil Science Systems Act. The Planning and Policy Committee had considered Title II in detail and found it to be the most controversial in relation to the Foundation because "it would greatly distort the Foundation and would almost definitively overshadow and conflict with its basic mission."[46] The PPC recommended that the Foundation seek a modest enhancement of its RANN program rather than assuming a lead role in major development and demonstration projects in the wide range of areas proposed in title II. In a final policy determination, the PPC/NSB position was as follows: Title I would have given NSF additional science policy responsibilities. The Board stated that this had already been accomplished by the acceptance of Reorganization Plan No. 1 of 1973, which assigned science policy advisory functions to NSF. The PPC stated that compliance with requirements for supporting demonstration projects would overshadow basic research. The PPC and NSB reached a compromise fall-back position—that RANN would selectively support some projects to the "proof of concept" phase.

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[41] NSB/NSP-75-7, February 20, 1975.

[42] See U.S. Congress. Senate. Committee on Commerce, Science and Transportation and Committee on Human Resources. A Legislative History of the National Science and Technology Policy, Organization, and Priorities Act of 1976. Committee print, 95th Congress, 1st Session. Washington, U.S. Govt. Print. Off., Apr. 1977. 824 p.

[43] ES :147 :7–13. September 7–8, 1972.

[44] PPC 6 and 7.

[45] ES :147 :12.

Title III, the Technical Manpower Transition Act, was opposed by the PPC and the full Board on the grounds that the Federal Government should use programs to increase jobs for unemployed scientists rather than retraining them.[47]

Title IV dealt with the Protection of Pension Rights. NSB opposed this title on the grounds that the job was the responsibility of the Secretary of Labor. A slightly revised form of the Committee recommendations was accepted by the Board as its position on S. 32.[48]

The February 1975 meeting of the NSP Committee concluded with a presentation by Dr. Press of the following potential future agenda items for the committee:

How can scientists and engineers contribute to regional and local needs, e.g., know-how for land-use planning, technological assessment systems etc.? There will be increasing pressures on the Foundation to develop and explore mechanisms to handle such problems.

What are our national goals and how can science and technology be used to achieve these goals?

How does one best utilize government response to a national need that involves many fields and agencies, e.g., urban problems, earthquake prediction?

What kind of continued effort can be devised to keep abreast of development in basic research support in government agencies and exert subtle pressure when desirable? How can the Foundation monitor, detect trends, and help alter, if desirable, basic research policies status of other agencies?

How can science and technology be utilized effectively in the international arena (entire question of science and technology in foreign affairs)? How can we be involved prior to commitments being made, rather than after?

In the past the Board has met with important administrators in Government. Should a Board committee be established to develop issues and prepare Board strategy/agenda to utilize these occasions for maximum benefit?

Is this a propitious time to reexamine the relationship between industry, universities, and the Federal Government as it affects research performance in and for the Government? This will be a key element of the eighth Board report; is that sufficient forum?

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[46] ES:153:10–13.
[47] 153:12.
[48] Ibid., p. 13.

> Is the Board to get more deeply involved in policy matters and still discharge its statutory obligations to NSF? Should the Board change its mode of operations vis a vis program review? Should NSB request change in legislation or make more use of outside consultants?
>
> Should the Board annually host an NSB working conference of one or two days of about 100 people including representatives of comparable bodies (Defense Science Board, Naval Research Advisory Committee, National Academy of Sciences Council, scientific and professional societies, etc)? These conferences would concentrate on a single major national issue, would enlarge perspectives of the Board, combine talents of many different bodies; and other advantages.
>
> Should the Board reformulate its position on a Department of Science?
>
> Should there be a National Science Board? Has it outlived its initial mandate? Should it redefine its mission? [49]

At the request of the Chairman of the Board, the NSP Committee at its meeting in March prepared an agenda for a meeting of the full Board with the President.[50] The agenda, which the Board agreed upon at its meeting in March, stressed the contributions of science and technology to the Nation and presented recommendations parallel to those contained within the Board's annual report for 1974, *Science and the Challenge Ahead*. The Board also agreed not to raise the matter of White House science advisory mechanisms with the President even though this topic was under active consideration in the Executive Office. On March 21, the Board met with President Ford and Vice President Rockefeller for one hour at the White House.[51] The Board's sixth annual report and accompanying presidential message were released the same day. In his message the President urged careful attention to the priorities for research recommended in the report.

4. NSB Response to the "Bauman Amendment" to the Fiscal Year 1976 NSF Authorization

At its fourth and fifth meetings in April and May 1975, the NSP Committee devoted most of its time to drafting a National Science Board policy position on the so-called "Bauman Amendment" to the NSF authorization for fiscal year 1976 and on a related bill.[52] Rep. Robert Bauman had introduced H.R. 4723 on April 9, 1975 as an amendment to the pending NSF authorization bill. Section 7 of this bill required that full information on all NSF proposed grants be furnished to the Congress and that awards for such grants be withheld for 30 days while Congress studied the appropriateness of the awards. H.R. 5796, introduced by Rep. C. E. Bennett on the same day, proposed that no Federal agency make any type of research grant until after a 30-day review period by appropriate committees in both Houses. At its meeting in May 1975, the Board unanimously adopted a revised resolution prepared by the NSP Committee opposing Section 7 of H.R. 4723 and H.R. 5796. The resolution stressed NSF's competence in reviewing research proposals, and stated that:

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[49] NSB/NSP-75-7, Feb. 20, 1975.

[50] NSB/NSP-75-12, Mar. 5, 1975.

[51] ES :171 :3, 19-21.

[52] NSB/NSP-85-15. NSB :ES :18-4, May 1975. See chapter V on the Programs Committee.

> The proposed legislation has the potential for producing serious weakening of science which has been made strong over the last 25 years by [NSF] sponsorship of the highest quality and priority research projects. . . . On its part the National Science Board will continue to ensure that the management practices of the Foundation operate to identify and support the best and highest priority research in the country. The National Science Board strongly urges the Congress to reject . . . the two bills [because they] propose to extend Congressional control in too great detail to be either effective or efficient.[53]

The legislative proposals opposed in this Board resolution did not become law.

5. Further Consideration of Science Policy Legislation and Related Board Functions

On May 22, 1975, President Ford met with the Vice President and several key congressional leaders and announced his approval of the Vice President's proposal to re-establish a science and technology office within the White House by legislation. The President decided in favor of a director with a small staff, rather than a council, to head the new office. This proposal was introduced by request by Senator Moss on June 20, 1975, as S. 1987. The provisions of S. 1987 were subsequently incorporated in Titles II and VI of S. 32.

The Board quickly became involved in considering the national science policy proposals before the Congress in the summer of 1975. The issue was discussed during meetings of Task Force 75–A of the Planning and Policy Committee held on June 18–20, 1975.[54] The task force unanimously adopted a resolution recommending that the Board develop a public position on the Administration's bill for an Office of Science and Technology Policy (OSTP). The task force also submitted the following recommendations to the Board relating to the Board's general ability to deal with national science policy issues:

1. The task force recommended that the Board should define a wider, more active, national policy role for itself in light of the four objectives: (a) Increasing scientific knowledge, (b) Disseminating scientific knowledge, (c) Identifying and delineating alternative applications of science, and (d) Encouraging applications of science; *OR* accept its present role and operational procedures and stop studying itself.

2. The task force decided that there seemed to be a number of deficiencies in the way the Board operated at present including: (a) Inadequate *policy* content to program reviews; (b) Devotion of too much time to discussions of Programs Committee recommendations; (c) Inadequate input from scientists, professional societies, citizens; and (d) No mechanism for identifying broad, national policy issues or for responding to them; and that, *IF* the Board wanted to improve these deficiencies *AND* adopt a wider role for itself, it should undertake a complete review of the resources and changes necessary to accomplish these objectives.[55]

The Board subsequently adopted a modified recommendation regarding the Board's operation and responsibilities and decided that:

(1) Board activities should be moved toward policy concerns and increased effectiveness of its oversight responsibilities;

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[53] ES :173 :15, 12.
[54] ES : 175 : 24–27.
[55] Ibid., p. 26.

(2) The Board should undertake a more active external role on science policy issue, and strengthen its linkages with external bodies; and

(3) The Board should undertake a study of possible mechanisms to increase the efficiency of its activities in order to accomplish the objectives in (1) and (2) above.[56]

The Board also accepted the task force's recommendation that the Board adopt a position on the Administration's OSTP proposal, as incorporated in S. 1987 and S. 32. The Board Chairman requested that the NSP Committee examine the relevant science and technology bills and formulate a draft position.[57] The Director, meanwhile, had been involved with the President, the Vice President, and a number of scientists in establishing task forces and making other preliminary plans for the proposed OSTP.[58]

Positions by the Board were later developed for various science and technology policy bills and were forwarded to the chairmen of relevant congressional committees by NSB Chairman Dr. Norman Hackerman. For example, the Board sent a letter on October 2, 1975, to Rep. Olin E. Teague regarding the national science policy bill (H.R. 9058) that he had introduced on July 30. The letter supported the bill, but suggested that its title I should "state explicitly the fact that basic research underlies all advances in science and technology" and pointed out that the Board did not believe that the bill's repeal of NSB's statutory annual reporting function would preclude the Board's reporting function:

> We feel that the statutory [annual NSB] report requirement [abolished by Title IV of H.R. 9058] has been useful in providing a medium for formal communication on scientific progress and problems to the President, the Congress, and the public. However, we would not interpret the repeal of this requirement to preclude our submission of reports from time to time to the President and the Congress on important scientific matters.[59]

Another letter sent from the Board to Senator Harrison S. Williams, Jr., on November 7, 1975, contained similar endorsements regarding H.R. 10230 (introduced as a revision of H.R. 9058 by Representative Olin E. Teague on October 20, 1975) and favorably noted that Title I of this bill explicitly recognized "the fundamental importance of basic research." [60] H.R. 10230 passed the House on November 6.

At its sixth and final meeting in November 1975, the NSP Committee considered the status of the science policy bills, noting that "the language which had been developed by the Committee on National Science Policy and supported by the Board was in the hands of staff members on the Senate side." [61]

6. *The Board's Enhanced National Science Policy Role Ends*

The Senate passed H.R. 10230, as amended, in lieu of S. 32 on April 27, 1975. A compromise version of both bills was agreed to and enacted on May 11 as P.L. 94–282, the National Science and

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[56] 175 : 25.

[57] NSB/NSP–75–15, Memorandum to Members of Committee on National Science Policy. Aug. 18, 1975.

[58] 175 : 16.

[59] Ibid., p. 24–25.

[60] ES : 176 : 11–12.

[61] NSB/NSP–75–24, Nov. 20, 1975.

Technology Policy, Organization, and Priorities Act of 1976. Three months later, Dr. Stever resigned as Director of NSF and was sworn in as the first Director of the Office of Science and Technology Policy. In his new capacity as OSTP Director, Dr. Stever provided science advice to the President (as stipulated by P.L. 94–282) during the remainder of the Ford Administration. P.L. 94–282 stipulated that the Director of OSTP, among other duties, advise the President, but did not create the post of Science Advisor to the President. Looking back on the impact and limitations of his role as Science Adviser to the President while operating from NSF as a base during January 1973 through the summer of 1976, Dr. Stever has summarized the constraints on a science advisory mechanism located outside of the White House:

> [W]e chose budgeting as the strongest line of attack to make our influence felt....
>
> While I believe that our work in the budget areas as exemplified by our advice on energy policy matters and energy R&D budgets to the Office of Management and Budget was a successful and worthwhile contribution, it did illustrate another one of the often-quoted weaknesses of the science-advising mechanism outside of the White House. We were not regularly asked to submit our position on all White House issue papers. Occasionally the OMB or the Domestic Council or some other units of the White House staff would ask for an independent submission, but for the most part we had to find out, through the legwork of staff, what the issues were, and if we felt strongly enough to submit an independent view, we could do so. But the fact that we did not have regular immediate contact with all White House events definitely gave us a handicap.[62]

Dr. Stever's comments on the importance of involvement in the initial stages of policy development for an effective science advisory role echo concerns raised in the letter sent by the full Board to the President in early 1975.[63] The Board's NSP Committee, which had assisted Dr. Stever in carrying out his functions as Science Adviser to Presidents Nixon and Ford through the close of 1975, did not meet again after its sixth meeting in November 1975. During the Board's annual consideration of National Science Board committees at its May 1976 meeting, the NSB Chairman reduced the number of committees and recommended that ad hoc committees would be utilized only when necessary for specific, short-range tasks.[64] The Board Chairman then discharged the NSP Committee along with five other committees. Dr. Press, who had chaired the NSP Committee, had served on the Board for over six years in May 1976 and his membership expired at that time. On June 1, 1977, Dr. Press was sworn as President Carter's Science Adviser and the second Director of OSTP.

It is interesting to note that a report on the respective roles of the Board and Director requested by the Director in 1976 made the following recommendation for implementing Board responsibilities in the area of national science policy through a new Committee on National Science Policy:

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[62] Science Advice, op. cit. p. 69–70.
[63] ES: 169: 11–12, 170: 38–40; discussed earlier in this chapter, section E. 2.
[64] ES: 181: 8.

> It is recommended that the Planning and Policy Committee be reconstituted as the Committee on National Science Policy charged solely with preparing recommendations to the Board for it to carry out its portion of the Foundation's responsibility to ". . . recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." (Sec. 3(d).)[65]

The Board never carried out this recommendation. The report also maintained that a crucial element in the usefulness of national science policy recommendations lies in (1) the receptivity of the users and implementers of such recommendations, (2) prior Board consultation with potential users, and (3) a systematic follow-up to appraise the extent to which a recommended policy is being implemented.[66]

E. Other Examples of National Science Policy Positions Taken by the Board, 1969–79

The Board has occasionally issued policy resolutions or has otherwise expressed definitive positions on matters concerning science and technology at a Federal or national level. Often, particularly after the PPC began its LRP exercises in the summer of 1976, such policy statements or resolutions were the result of extensive deliberations. (See chapter VI.) Examples of national science policy-related positions adopted by the Board since 1969 and not addressed elsewhere in this report are presented below.

1. Selective Service System (1969)

On May 19, 1969, the Chairman of the Board (Dr. Philip Handler) sent a letter to the President conveying the support of the Board for the President's proposal to reform the Selective Service System.[67] The letter stated that, even though the draft was making profound inroads on graduate enrollments, the Board "would not ask that graduate students, largely derived from our middle class, white population, be made yet a more privileged group." "Accordingly," the Board concluded, "we strongly support conversion to a random 'lottery' system effective at age 19, in which all able-bodied young men participate."

2. Role of Professional Societies, Commercial Organizations, Universities, and Government Agencies in the Information Transfer Process (1971)

At its meeting in October 1971, the Board approved a statement enunciating and clarifying existing relationships between the Foundation and the several kinds of activity concerned with science information.[68] Six policies were stated addressing (1) the development of information resources through a variety of concerned organizations, (2) temporary NSF support of certain essential publication activities, (3) NSF endorsement of secondary information processing (that is, abstracting and indexing) activities, (4) NSF recognition of a primary role for commercial firms in developing and marketing products and services deriving from the machine-readable output of secondary processing (that is, retrievable computerized abstracting data bases) carried out by non-profit activities, (5) NSF support of university-based information systems with encouragement to use commercial services when available, and (6) an NSF requirement that all machine-readable information resources generated through NSF support be made equitably available at reasonable prices. These policies reflect the approach already taken by NSF's (now-defunct) Office of Science Information Service which were found to be acceptable to officials of the commercial and university private-sector groups which they affect. NSF's information dissemination role lessened substantially by the summer of 1978.

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[65] Hoff, William J. The National Science Foundation: Board and Director. A study prepared for the National Science Foundation, May 28, 1976, p. 34. (NSB–76–199, June 11, 1976.)

[66] Ibid., p. 37–38.

[67] NSB–69–150, May 22, 1969.

[68] NSB–71–279, 142: 7–8.

3. National Science Foundation Patent Policy (1973)

In March 1973, the Board adopted an NSF patent policy after earlier consideration by the Planning and Policy Committee.[69] The policy applies to all research grants, contracts, and other arrangements entered into by the Foundation. Several provisions of this policy have implications for scientific and technological activities at a national level. For example, the patent policy provides the following:

> A major objective of NSF's patent arrangements will be to encourage the use of inventions arising out of activities supported by the Foundation.
>
> The Government retains the right to grant NSF licenses, unless the NSF grantee has taken effective steps within three years after a patient issues to bring the invention to the point of practical application.
>
> NSF may enter into separate institutional agreements with academic or other nonprofit organizations in certain circumstances. Such agreements will require that the institution use any net royalty income retained by it for the support of education or scientific research.

4. Women in Science (1975)

The Board adopted a resolution at its meeting in April 1975 in response to the United Nations General Assembly proclamation (December 18, 1972) of the year 1975 as the International Woman's Year, and to the President's Proclamation (January 30, 1974) and Executive Order (January 9, 1975) giving full support to the International Woman's Year and establishing a National Commission on its observance. In its resolution, the Board endorsed the promotion of equality between men and women, urged that educational and scientific communities make renewed efforts to increase and improve the roles of women within these communities, and pledged the following:

> To assure the fair competition of women for NSF grants and contracts;
>
> To increase the number of women on NSF advisory panels and committees;
>
> To enhance the public awareness of the current and changing roles of women in science and technology;
>
> To improve understanding of motivational factors which encourage the selection by women of science careers; and

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[69] ES: 154: 9, 16–20.

To encourage, through direct example, equal hiring and promotion of qualified women at all levels of employment.[70]

5. *Basic Engineering Research Program of the Department of Energy (1979)*

The Board adopted a brief statement in February 1979 endorsing the Department of Energy's (DOE) intention to provide in its proposed budget for fiscal year 1980 and beyond support for the Basic Research in Engineering program in DOE's Office of Energy Research, a program which was initiated in fiscal year 1979.[71] The Board encouraged the further development of DOE's Basic Research in Engineering program.

F. NSB INVOLVEMENT IN RECENT SCIENCE AND TECHNOLOGY REPORTS

The National Science and Technology Policy, Organization, and Priorities Act of 1976 (P.L. 94–282) established the Office of Science and Technology Policy within the White House. The Act assigned to OSTP, among other functions, the responsibilities to (1) periodically survey the nature and needs of national science and technology and make recommendations to the President for review and transmission to the Congress through an annual Science and Technology Report and (2) prepare and annually revise a Five-Year Outlook report on trends, opportunities, and constraints emerging with respect to science and technology in the United States. The Act further required that the OSTP Director work in close consultation and cooperation with the National Science Board, among a number of other Federal agencies and councils.

The Board apparently has not spent much time on those responsibilities. In March and April of 1977, the Board's Ad Hoc Committee on NSB and OSTP Annual Reports convened four times, during which communication took place between the Committee and Dr. Press, Director-designate of OSTP, regarding plans for preparing OSTP's statutory report.[72] During the March 1977 meeting, the science adviser proposed that the NSF and the OSTP should cooperate in producing policy reports and that the Board should help OSTP prepare its statutory report.[73] The Chairman appointed the Ad Hoc Committee to evaluate these issues. Subsequently, the chairman of the Ad Hoc Committee reported to the Board that he had "discussed the reports with Dr. Press and had promised to send him a document outlining some of the opportunities and problems with regard to soliciting information from the mission agencies from NSB experience in the preparation of its reports." [74]

In the spring of 1977, President Carter's reorganization team addressed alternative administrative and organizational arrangements for the Executive Office of the President, including OSTP and its new annual reporting function. Among the recommendations formulated was a proposal to transfer to the National Science Board responsibility for the OSTP annual report to the President. The Board

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[70] NSB–75–163; 172: 13, Apr. 21, 1975.
[71] NSB/Res–79–22/B (as revised, Mar. 5, 1979); 204: 14.
[72] CS: 189: 10.
[73] CS: 188: 5.
[74] Ibid.

Chairman pointed out at the Board's June meeting that preparation of such a report by the Board would require careful consideration because it would "involve technology in its broadest sense, an area beyonnd the normal purview of the Board." [75] The President's Reorganization Plan No. 1 of 1977 ultimately transferred OSTP's responsibility for the preparation of the two science and technology reports to the Director of NSF, effective February 24, 1978.[76]

1. Annual Science and Technology Report

The Director of NSF assigned responsibility for the preparation of the first annual science and technology report to the Directorate for Scientific, Technological, and International Affairs, which, according to some observers, was created to assist OSTP.[77] The Director also reported to Board members that they would be requested to comment on the first draft of the report.[78] The final version of the annual report, *Science and Technology Report: 1978*, was "revised to include changes proposed by several Board Members and others," and was then sent to the White House for clearance for transmission to Congress.[79] Board members were again asked to comment on the second *Annual Report on Science and Technology* after STIA's draft had been prepared.[80] Thus, the Board has had only a minimal role in the preparation of the annual science and technology reports.

2. Five-year Outlook Report

It was originally assumed that the NSB, along with the OSTP, the NAS, and other agencies and peer reviewers would be asked to comment on the five-year outlook report drafted by the STIA with assistance from the National Academy of Sciences and possibly that the report would be transmitted jointly by NSF and the OSTP via the President to the Congress.[81]

After STIA's first draft of this report was prepared, the Foundation convened an expert review panel, which criticized the draft severely. Comments were also requested from Board members.[82] The Director also requested comments from Board members on his proposed Director's statement to accompany the final version of the *Five-Year Outlook Report.*[83]

3. NSB and Other Reviews of Reports

There has been considerable legislative branch review of these reports. In general, the reports have been criticized for reflecting a narrow perspective, not the broad perspective that should be reflected in a presidential report, and for omitting the long-range policy guidance intended by Congress.[84] The Board's review of these two types of NSF-prepared reports has been limited to individual comments by interested Board members. Generally the Board does not make or take a formal Board position on these reports. Dr. MacLane commented negatively about the quality of the NSF-prepared drafts of both the annual science and technology report and the *Five-year Outlook* report during the eleventh Executive Committee meeting in 1979:

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[75] 191 : 3.

[76] Reorganization Plan No. 1 of 1977, July 15, 1977, amended on Sept. 14, 1977 (Federal Register, vol. 420, Oct. 21, 1977 : 56101) effected by E.O. 12039, Federal Register, vol. 43, Feb. 24, 1978 : 8095.

[77] STIA was created on July 10, 1975.

[78] 197 : 7. Copies of the draft report were distributed to Board members two months later, and at that time Board members were asked to comment within two weeks. (199 :7)

[79] 200 : 8.

[80] EC : 19–11 : 7.

[81] Mogee, Mary Ellen. Science and Technology Policy : Office of Science and Technology Policy and National Science Foundation Relationships. *In* U.S. Congress. Senate. Committee on Commerce, Science and Transportation. Subcommittee on Science, Technology, and Space. Oversight of Science and Technology Policy. Hearings, Feb. and Apr. 1978. Part 2. (Serial No. 95–77) Washington, U.S. Govt. Print. Off., 1978, p. 271.

[82] Ibid.

[83] EC : 79–12 : 11–21.

> [He] stated that he was deeply concerned about the quality of the reports emanating from NSF. Speaking from a background of much experience with reports, he stated that he had been increasingly discouraged about those NSF reports he had read recently. It was his opinion that the First Annual Report on Science and Technology (summer 1978) was poor, and that the draft of the Second Annual Report on Science and Technology is also of inferior quality. Then there is the massive first draft of the first Five-Year Outlook Report. It appears to be a confused shambles. He wondered why three successive reports prepared by STIA should seem so unsatisfactory.[85]

The Director had no solution:

> The Director stated that it had been a heavy burden on STIA to prepare these mandated reports with limited and changing staff. Unfortunately, not all the individuals were trained in the areas in which they are being asked to work.[86]

4. Science Education Report

By memorandum dated February 8, 1980, President Carter directed the Secretary of Education and the Director of NSF to review U.S. science and engineering education policies at the secondary and university levels to ensure that appropriate measures are being taken to preserve U.S. strength in that area. A report was requested with recommendations by July 1 (later extended to August 15), 1980. At the Board's February 1980 meeting, the Director informed the Board that a draft of the requested report would be available to the Board for its consideration by May 1.[87] At that meeting the Board also accepted the Planning and Policy Committee's recommendation to discuss "The development of scientific careers" as one of the topics at the Board's June long-range planning meeting. The completed draft report to the President was sent to the Board and some 150 reviewers. Comments from Board members and about 50 useful critiques subsequently were received by the Director. According to the Director, all of these critiques "significantly contributed to the quality of the report" through later modification of the report by NSF staff.[88] The report was released to the public several months later.[89]

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[84] U.S. Comptroller General. The Office of Science and Technology Policy: Adaptation to a President's Operating Style May Conflict With Congressionally Mandated Assignment. (PAD–80–79.) Washington, U.S. General Accounting Office, Sept. 3, 1980, 54 p. See also: U.S. Congress. House. Committee on Science and Technology. Research and Development in the Federal Budget. Hearings, April 1979, 96th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 1979, 452 p.; and U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. Review of the National Science Foundation Organic Act. Hearings. May and September 1979. 96th Congress, first session. Washington, U.S. Govt. Print. Off., 1979, 400 p.

[85] EC: 79–11: 19.

[86] EC: 79–11: 10.

[87] 213: 11.

[88] 217: 9.

[89] National Science Foundation. Science and Engineering Personnel. National Overview (NSF 80–316). Washington, U.S. Govt. Print. Off., 1980, 48 p.

G. IMPLICATIONS FOR A NATIONAL SCIENCE POLICY ROLE IN THE 1980s

The information presented in this chapter indicates that the Board's "national science policy" responsibilities have been limited mainly to issues regarding the governance, funding, and infrastructure for research, especially basic research, that is, "policy for science" issues. While the focus of the Board's concern has not been limited exclusively to such issues as they relate to NSF, the Board has spent the most time on such issues. This role is a distinct contrast to a broader national science policy role—that is, developing policies for the use of science and technology in policymaking, that is, "science for policy" issues. The Board's basically unsuccessful experiences with such a broader role during the period when the NSF Director was also the Science Adviser raise many questions about the feasibility of the Board embarking upon a broader policy mission in the 1980s.

Currently, Board officials hold different positions on this issue. During 1980, the NSB Chairman Branscomb told the Board that it should take steps to improve the utility of the Board's long-range planning meetings. Procedural work should be minimized in favor of discussing long-range issues in depth. "Board members . . . [should] try to focus on the major underlying issues that the Board frequently becomes 'involved in,' often without sufficient time to discuss indepth." Discussion groups should make specific recommendations for additional work which the Board might undertake and mechanisms to accomplish tasks. Recommendations should also be addressed to the staff and to the science adviser. Previously, Dr. Branscomb had listed four strategic issues with which he thought the Board should concern itself over the next five years: productivity, industrial technology and innovation; key fields at the cutting edge of science; the world scene; and rebuilding the Nation's technology. He also re-created the PPC National Science Policy Subcommittee, later renamed the NSB and National Science and Technology Issues.

Similarly, in his last appearance before the Board, Dr. Frank Press, the President's science adviser in a departure from the statement he had made several years earlier in which he concluded that the Board could not play an effective national science policy rôle, recommended that the Board take on such a broad national role. According to the minutes of the October 1980 meeting:

> Dr. Press encouraged the National Science Board to assume a more active role in analyzing, discussing formulating recommendations, issuing statements and white papers on broad scientific policy matters that the Nation faces. He invited the Board, for example, to consider whether and where there are manpower shortages, whether there is adequate support for economic revitalization; whether there is support of the basic sciences in the country; or whether to undertake a comparative study of scientific policies in this country versus those in other countries. There are many questions like these which are extremely important that deserve the attention of a unique body like the National Science Board. In fact, Dr. Press observed, that there is no other body like the NSB in Washington—a body drawn from many scientific disciplines and geographic areas charged in its Organic Act to consider broad scientific and technological questions. For the

> National Science Board to become fully involved in those kinds of issues is right, it is timely, it has a charter to do so, and Dr. Press thought that it should so act.[90]

In contrast, former Board Chairman Hackerman has said that he does not believe that NSB should get too involved in national science policymaking dealing with potentially controversial science and technology issues which would rob the Board of its apolitical style:

> . . . There will be a need for PSAC, the National Science Board, two or three of the agencies of that sort, in which the scientific community will have the chance to express opinions and to provide fresh ideas.
>
> This doesn't mean that the National Science Board will continue indefinitely into the future. I suspect it has a pretty good standing. It is an unusual body in that it's not advisory, but functional. Because it's unusual in that sense, it comes under fire a great deal. Yet it doesn't provide the kind of national science policy advice that undoubtedly is needed.
>
> So it may be that, again, a PSAC-like body will be convened to provide that. And that's not all bad. If the Board got too close into the policymaking activity, it could become even less apolitical than it currently is. Its apolitical nature is pretty valuable to it. . . . [By and large, it's been able to take stands on things on which it should take stands. It has missed out on a few things.] [91]

It seems inevitable that in order to succeed in dealing with national science policy, the NSB would have to choose to respond to OSTP requests for assistance which the NSB has usually turned down; the White House and the President's Science Adviser would have to seek out NSB policy guidance deliberately and the Board would have to agree to involve itself in controversial science policy decisions and matters of scientific dispute, issues which students of the OST and OSTP characterize as critical to the function of national science policy-advising. It also might be necessary for a Board seeking to influence other agencies to consider the relatively smaller size, budget, and influence of the Foundation when compared with other agencies which support science and technology.

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[90] 220 :20.

[91] Comments of Dr. Norman Hackerman at meeting at NSF Advisory Council, March 1980 : 9–10.

X. ORGANIZATION OF THE NATIONAL SCIENCE FOUNDATION: THE REACTIVE ROLE OF THE BOARD

A. Introduction and Overview

In contrast to other areas where it seems to play a major role, the Board generally seems to play a reactive role in matters dealing with NSF's organization and reorganization. This is due, in part, to a 1968 revision in NSF's authority, which curtailed the NSB role in matters of organization, requiring the Director only to consult with the Board in such issues. This chapter examines the Board's role in several major and minor reorganizations and in activity related to the initiation of new programs. The Board has not initiated any of the major organizational changes in NSF. Some of these, for instance the creation of the Research Applied to National Needs Program (RANN), were initated by OMB without consulting the Board. In some cases the Director has presented the Board with faits accomplis, or with organizational plans he drew up for Board approval. In three major instances NSB delayed or obstructed these plans because of 1) objections, especially to adding applied science to NSF, and 2) to allow time for development of support or consensus generation within the wider scientific community. In one reorganization, the creation of the Directorate for Applied Science and Research Applications (ASRA), the Board managed to modify slightly the Director's proposed plans. In two cases, creation of the Directorate for Engineering, and creation of the Engineering and Applied Sciences Directorate, the Director's plans were adopted virtually as presented to the Board. The Board has almost no role to play in the initiation of new programs—which usually are mandated by the Congress, for instance most minority educational support programs, the Comprehensive Assistance to Undergraduate Science program (CAUSE), the Science for Citizens program, and the appropriate technology program. (See appendices L, M, N, O, and P.)

The absence of a preeminent Board role in matters of organization and reorganization is caused by several factors. Perhaps most relevant is the fact that most of the programmatic changes that NSF makes are imposed externally—by the Congress and by the Office of Management and Budget. Of equal importance is the fact that most of these changes deal with applied research and with science education. These areas fall outside of the mainstream of NSF's traditional mission and are areas which NSB—whose major objective is to maintain the strength of basic research in major research performing academic institutions—has never seemed comfortable with and has sometimes opposed as new program areas to be added to the Foundation's mission.

Some illustrations of this pattern follow. First, indicative of the permanence of the organization's traditional goal over time, data show that, while the Foundation's budget has almost quintupled (in current dollars) since 1970, basic research funding consistently has constituted about 90 percent of the agency's research expenditures. Thus, changes in the NSF's mission occur within a limited expenditure range, constituting on the average about ten percent of the agency's total research budget. (See table 15.)

TABLE 15.—NSF BASIC RESEARCH EXPENDITURES AS A PERCENT OF TOTAL RESEARCH EXPENDITURES

[Dollar amounts in millions]

Year	Total research expenditures	Basic research expenditures	Percent of total
1970	$275,000	$245,000	90
1975	570,000	486,000	86
1977	688,000	624,000	90
1979 (estimate)	811,000	741,000	91
1980 (estimate)	901,000	828,000	91

Source: Figured data from data in U.S. National Science Foundation. Federal Funds for Research and Development. Fiscal years 1978, 1979, and 1980, Detailed Statistical Tables, vol. XXVII, passim.

Another measure can be used to estimate the effect of externally initiated changes on NSF. The Programs Committee and then the full Board are required to approve all new programs before delegating authority to the Director to award funds. For the last six years the Board has reported biennially on these delegations. An identification of the origin of these programs was made by searching NSF budget documents and legislative history materials. The data for the analysis are portrayed in appendices L, M, and N and are summarized in table 15. A variety of other new program initiatives are made each year. A listing of these was obtained from several sources, and NSF budget and legislative history materials were searched to identify program origin. This data is arrayed in appendix O and is summarized in table 16. The data indicate overwhelmingly that most new NSF programs are in the applied and science education areas and that most of these are initiated by Congress and the Administration, specifically OMB, not by the NSF. On the other hand NSF tends to initiate new programs that are basic in nature. Referring only to new programs reported in the NSB delegations of authority to the Director for new programs, there were 26 new programs, seven in basic research, of which NSF initiated three. Congress initiated 15 of the 19 applied or non-basic new programs. Of the other new identifiable programs that did not require delegations of authority, 18 of the 53 were basic in nature, and NSF initiated 11 of the 18. Of the 35 applied or non-basic programs, NSF initiated only one.

TABLE 16.—ORIGIN OF NEW PROGRAMS LISTED IN BIENNIAL REVIEWS OF DELEGATION OF AUTHORITY TO DIRECTOR, 1968–80

	Initiated by—			
	Congress	NSF	Administration/OMB	Total/NSF
Basic	2	3	2	7/3
Applied or nonbasic	15	2	2	19/2

TABLE 17.—ORIGIN OF OTHER NEW IDENTIFIABLE PROGRAM INITIATIVES FROM SOURCES OTHER THAN THE BIENNIAL REVIEWS OF DELEGATIONS OF AUTHORITY TO DIRECTOR

	Initiated by—			
	Congress	NSF	Administration/OMB	Total/NSF
Basic	4	11	3	18/11
Applied or nonbasic	28	1	6	35/1

A second factor has contributed to the absence of a preeminent Board role in organizational issues. This is a congressionally imposed move to curtail the Board's authority in this area in favor of the Director. The original NSF Act, passed in 1950, mandated the creation of several divisions and gave the NSB authority to establish others. The NSF Director had no apparent statutory authority to deal with matters of organization. The legislation specified that:

> SEC. 7. (a) Until otherwise provided by the Board there shall be within the Foundation the following divisions:
>
> (1) A Division of Medical Research;
>
> (2) A division of Mathematical, Physical, and Engineering Sciences;
>
> (3) A Division of Biological Sciences; and
>
> (4) A Division of Scientific Personnel and Education, which shall be concerned with programs of the Foundation relating to the granting of scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, and other sciences.
>
> (b) There shall also be within the Foundation such other divisions as the Board may, from time to time, deem necessary.

In the 1968 amendments, the Director was given preeminent authority on matters of organization, in consultation with the Board. The new legislation reads:

> There shall be within the Foundation such divisions as the Director, in consultation with the Board, may from time to time determine.

However, since 1968, the Board's role has been one mainly of reaction—often acquiescence, but sometimes opposition—to *faits accomplis* from the Director's decisions or external events, including actions of OMB. During this period the Board did not appear to give issues of NSF's organization much attention. None of its major continuing (standing and task) committees has had any apparent responsibility for organizational issues. The Board has established *ad hoc* committees to deal with organizational issues—but usually only after the Director has announced a reorganization decision. The Board's basic posture since 1968 has been basically one of attempting to maintain and increase NSF's responsibiilties for basic research in universities.

Since late 1979, the Board appears to have taken a more active role in discussions and decisions relating to reorganization of NSF. This may have occurred because the directorship of the NSF was vacant when some of the major decisions needed to be made. Despite the Board's recent interest in these issues, the OMB and the Director remain supreme in matters of organization. It appears as if the Board's primary concern with maintaining and strengthening NSF's basic research capabilities has probably prevented the Board from taking the lead in most organizational matters. However, such a posture is probably entirely consistent with expectations of how the Board should spend its time.

The next four sections describe in detail the Board's role in NSF's four major reorganizations made since 1968. Appendix P lists some of the other changes that the Director made with little apparent discussion by the Board, as well as programmatic changes and reorganizations prompted by congressional and administrative action.

B. CREATION OF THE RANN PROGRAM

1. *Program Origins*

The Research Applied to National Needs (RANN) program owes its origin in large part to the widely held assumption of the late 1960s that federally supported research could help solve society's problems. This was embodied statutorily in P.L. 90–407, July 18, 1968, which amended the National Science Foundation Act of 1950: ". . . to initiate and support scientific research, including applied research, at academic and other nonprofit institutions" and "when so directed by the President, the Foundation is further authorized to support, through other appropirate organizations, applied scientific research relevant to national problems involving the public interest." (Section 3(c)) Basically the Act gave the NSF authority to continue to support promising research projects when they passed into the realm of applied research and permitted it to support research at "other appropriate organizations" (basically industrial research facilities) when the research was relevant to national problems involving the public interest.[1]

Representative Emilio Q. Daddario, who was Chairman of the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics when the legislation was passed said that Congress did not intend "NSF to become directly involved in applications activities, nor for applications to become a large item in the NSF budget,"[2] and "that Congress would not have supported the concept of research applications in NSF if it had thought that the . . . program would detract from the Foundation's support of basic research."[3]

The Interdisciplinary Research Revelant to Problems of Our Society Program (IRRPOS), initiated in December 1969, was the Foundation's first reaction to its new authority. The Board appears to have played only a minor role in this program, which the staff originated at the Director's request. The NSB apparently endorsed the staff-prepared program outline.[4] Subsequently NSF allocated up to $6 million for the new program out of the fiscal year 1970 funds and requested $10 million for the program in the fiscal year 1971.

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[1] Most of this discussion is based on: Mogee. Mary Ellen. Reorganization of the Research Applications Directorate in the National Science Foundation: The Directorate for Applied Science and Research Applications, CRS white cover report. Mar. 16, 1978: 36 p. (Mogee, 1978.)

[2] Mogee, op. cit., p. 4, citing. Emilio Q. Daddario. Remarks at the Fifth Meeting of the NSF Science Applications Task Force, May 23, 1977.

[3] Idem.

2. OMB's Instructions to Create RANN

Despite criticisms of the IRRPOS program, the Office of Management and Budget, reflecting the President's desire to deploy science and technology to solve societal problems[5] (another initiative of the time was the New Technological Opportunities Program, NTOP), directed the National Science Foundation in December 1970, to establish a successor program to IRRPOS, to be funded at over $50 million to deal with research on specific societal problems.[6] According to Mogee, the Office of Management and Budget and the Office of Science and Technology in the White House kept close control over the funding:

> Attached to the extra money for problem-oriented research was a requirement by OMB that before the funds would be released, program and management plans would have to be developed with the guidance of both OMB and OST.[7]

According to a history of NSF, *A Minor Miracle*, NSF Director McElroy, who generally is reputed to have acted independently of the Board, conferred often with OMB, the Science Adviser, and other agency officials regarding the Administration's objectives for the new program. The Director knew that the Administration wanted the new applied research program to be "aggressively pursued" and to show results quickly. He was also aware of the fact that the OMB attached certain conditions to program initiation in NSF. OMB promised the NSF Director $100 million over the agencys original budget request—with $50 million allocated for the new applied research program and the other $50 million for NSF's effort to absorb basic research programs that had been supported in other Federal agencies, but terminated pursuant to the Mansfield Amendment. According to the NSF history, *A Minor Miracle*, OMB also insisted that, in return for the funding for applied research, NSF would have to:

> Terminate all institutional support activities and abolish the Institutional Support Program (for education and development of institutional capacity in science),

and that

> With respect to cutbacks in science education, reduce or discontinue all arrangements for the distribution of fellowships and similar awards, and reduce and discontinue activities aimed at sharpening the skills of science teachers.[8]

NSF Director McElroy followed the customary practice of bringing this matter to the Board. But apparently he chose not to tell the Board all that he knew about the proposed program. Mogee reports that McElroy took the matter to the Board on December 17, 1970. But:

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[4] Lomask, Milton: A Minor Miracle: An Informal History of the National Science Foundation. Washington, U.S. Govt. Print. Off. 1976, p. 219.

[5] Mogee, Mary Ellen, Public Policy and Organizational Change: The Creation of the RANN Program in the National Science Foundation, M.A. Thesis, The George Washington University, Washington, D.C., Dec. 22, 1972: 64. (Mogee, 1972.)

[6] Ibid., p. 65.

[7] Mogee, 1972, op. cit. p. 66.

[8] A Minor Miracle, op. cit., pp. 239–240.

McElroy spoke before the NSB of a large amount of additional funds, not being very specific except to say that they would be spent largely to support applied research. [His deputy] Bisplinghoff presented a paper to the Board entitled "Applied Research at the NSF." The National Science Board voted to approve "the Director's general organizational and program plans for expanding Foundation support in applied areas, as authorized by the 1968 amendments to the NSF act." The decision on the exact amount to be allocated to the new program was later communicated by Dr. McElroy to the Chairman of the Board by phone.[9]

Apparently there was little indication of the other changes required by OMB. Writing in *a Minor Miracle*, Lomask said:

> Whether McElroy can be said to have bypassed the National Science Board on this one is a moot point. With the next meeting of that body scheduled for December 17, he had to work fast. In a memo for the Board, dated December 15, he outlined his plans. His major proposal was that most of NSF's existing problem-oriented activities, including IRRPOS, be brought together under a newly created and newly named directorate of the Foundation to be headed by an Assistant Director equal in rank to the other four Assistants then in office.
>
> Aside from this concrete suggestion, the memo dealt for the most part in generalities. Much of it consisted of arguments calculated to quiet the fears of many Board members that an enlargement of NSF's role in applied research would detract from its position as the country's preeminent guardian of basic research.
>
> One of McElroy's points was that most of the problem-oriented work supported by the Foundation would involve a large amount of basic science. His reasoning was that more often than not those responsible for tackling a social problem would find that some of the fundamental knowledge required for its solution was not yet on hand. It followed, he reasoned, that "a determined assault on an important area of applied research could form an umbrella under which increased support of relevant basic research would take place."
>
> The Director took pains to point out that NSF had no intention of taking on projects that the Federal mission agencies were in a position to pursue. . . .
>
> In his memo to the Board McElroy did not specify precisely how much money he hoped to spend on the new program. Later, after the December 17th Board meeting, he would convey this figure—$81 million—to the NSB chairman by phone. He did note in his memo that he thought it 'not unreasonable to expect that up to 25 percent of an expanded NSF budget could be devoted to the new program." . . .
>
> If any Board members voiced objections to McElroy's ideas during their December meeting, the record fails to show them. All the minutes reveal is that the "Board approved the Director's general organizational and program plans for expanding Foundation support in applied areas, as authorized by the 1968 amendments to the NSF Act." [10]

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[9] Mogee, 1972, op. cit., p. 67, citing interviews and 134; 2, Dec. 17, 1970.
[10] Lomask, op. cit., p. 241–243.

Thus, the National Science board's role regarding the initiation of the RANN program seems to have been confined to acquiescence in an externally imposed decision. The Board did not play a major role in drawing up plans for the new applied research effort or in suggesting project options for the new Directorate.

Shortly after the Director informed the Board that additional funds would be available for a new applied research effort, he formed an ad hoc task group to formulate plans for this new activity. During the six weeks during which plans were drawn up and a name chosen, the working group reported that it drew to a large extent on studies already written by such groups as the National Academy of Sciences and the National Goals Commission, calling for better use of science and technology for national objectives in defining the boundaries of the program. Apparently the National Science Board was not asked to contribute to this exercise. The ad hoc group presented its initial plans in a report called the *RANN Task Force Report*. It also suggested the name of the new activity and recommended that it be managed by a new directorate.[11]

The recommended program, called the Research Applied to National Needs (RANN) program, was created in February 1971 when the Foundation brought into one Directorate the various problem-focused research programs which it was funding, including IRRPOS, the Weather Modification and Earthquake Engineering programs, the Intergovernmental Science Program, and some other research funded formerly under the Scientific Research Project Support program.[12] Despite some concerns, Congress approved the program and RANN obligations totaled about $484 million from fiscal year 1971 to fiscal year 1978, broken down as follows:

TABLE 18.—HISTORY OF RANN OBLIGATIONS

Fiscal year:	*Millions*
1971	$34
1972	54
1973	70
1974	75
1975	84
1976	72
1977	68
1978	63

Source: Mogee, 1978, op. cit., p. 6.

3. NSB Reaction to RANN

Dr. Philip Handler testified on the RANN program before the House Subcommittee on Science, Research, and Development in late March and early April 1971. Although he had been an NSB Chairman and was then a member of the Board, he made it clear that he was testifying as President of the National Academy of Sciences, not as NSB Chairman. Dr. Handler opposed the NSF/OMB plan for RANN on the grounds that it was the "beginning of dangerous new directions for the NSF and for science itself."[13] In particular, he opposed OMB's shift of NSF funds to problem-oriented research from programs of fellowships and traineeships, and from institutional support.[14] According to Mogee, Handler testified that this move contradicted NSB-enunciated policy. Specifically:

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[11] Mogee, 1962, 68–71.
[12] Mogee, 1978, Ibid., pp. 4–5.
[13] Mogee, 1962, op. cit., p. 81.

> Handler suggested that the requested changes were not entirely voluntary on NSF's part by recalling to the Subcommittee the NSB report, *Toward a Public Policy for Graduate Education in the Sciences*, of 1969. This report strongly supported institutional and educational grants by the Federal Government for science. This seeming contradiction in philosophy between the report and the requested budget implied that the NSB might have been overridden in its objections to the changes.[15]

The Subcommittee asked the current Board Chairman Dr. Carter whether or not he supported the NSF request. He replied that the Board did. Nevertheless it is generally acknowledged, as Mogee states, that: ". . . It was suspected that the new program was partly forced upon NSF by the administration. . . ."[16]

The Board's only reaction to RANN was its opposition to the cuts in the institutional programs that OMB was forcing upon NSF and that the NSF Director seemed compelled to agree with.[17] At its meeting in January 1971, the Board, which had an Institutional Committee, attempted to try to salvage the institutional support program[18] and issued a policy statement in support of it.[19] Subsequently in April the Board Chairman wrote a letter to the President asking for more support for NSF programs in facilities, equipment, and science education, all programs that suffered as a result of the establishment of RANN.[20] Apparently the NSF Advisory Committee for Institutional Relations also wrote a letter of complaint, but to OMB Director Shultz.

Despite these attempts (which undoubtedly came too late, and which were no match for OMB), on January 28, 1972, six days after Director McElroy left NSF and two days before the new Director Dr. H. Guyford Stever assumed his responsibilities, the Acting Director disestablished the Institutional Programs Directorate.[21]

4. NSF Attempts To Improve RANN Program Quality

Although the Board played virtually no role in establishing the RANN program, it did have some effect on the administration of the program after it began. The Board's first reaction to RANN was to treat it as an on-going activity; in February 1971 it stated: "Since RANN is an expansion of IRRPOS and contains components of other ongoing Foundation programs, RANN should not be considered a new program."[22] The Board Chairman requested the Institutional Committee "to serve as a review group for the Board on all RANN proposals. . . ."[23]

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[14] 1972 NSF Authorization Hearings, op. cit., p. 698, as cited in Ibid., p. 82.

[15] Mogee, 1972, op. ct., pp. 82–83.

[16] Ibid., p. 83.

[17] ES : 129 : 6.

[18] On this point, the author of *A Minor Miracle* reported: "It would appear from McElroy's correspondence file that he was not happy at the prospect of closing out the Foundation's institutional efforts. [According to an OMB staff member] . . . he voiced no objections to doing so at the December 13th conference [with OMB to discuss specifics]—a recollection that seems to bear out Dave Ryer's statement that one of McElroy's attributes as an administrator was that 'he knew when to fight—and when not to fight.' By the end of the session, the Foundation had accepted all of OMB's conditions, and, . . . the NSF Director 'was smiling when he left the room.'" (A Minor Miracle, op. cit. p. 241.)

[19] ES : 135 : 14.

[20] ES : 138 : 12–13.

[21] The programs supported by the Directorate had been transferred earlier to the Directorate for Administration and would be phased out on orders of OMB, which was forcing the Foundation to create the RANN program. (Mogee, 1972, *op. cit.*, pp. 90, 93.)

Although the RANN program already had been implemented, the Board decided to assess the future of the program and its implications for academic institutions at its June 1971 LRP meeting. The PPC also recommended that staff prepare guidelines for awards and that the Programs Committee review all RANN awards until the program was operating in a satisfactory manner. A few months later, staff presented the Board with two papers on "RANN Guidelines" and on "RANN Program Impact on National Science Policy." Board members raised so many questions in the ensuing discussions that the Chairman referred the documents to the Planning and Policy Committee for refinement prior to subsequent discussion at the October Board meeting.[24]

The PPC members had "decided that there was more to the problem [of the RANN documents] than an editorial review of these documents and that it would be more useful if the Committee prepared a list of 'concerns' of the Board members regarding RANN," which it did. The PPC also discussed the newly created Committee on RANN Coordination of the Federal Council for Science and Technology, designed to communicate between NSF, the OST, OMB, and interested mission agencies.[25] In November 1971, after RANN had been operational for nine months, the Chairman established an Ad Hoc Board Committee on RANN policy to serve as an oversight committee, in a liaison capacity with the staff, and to supplement the Programs Committee, which reviewed individual proposals, and the Planning and Policy Committee which refined the draft papers.[26] This action, in effect, reversed the Board's earlier decisions since the Board now decided to treat the RANN program like a new area, and delayed the processing of proposals until a study group provided the Board with revised regulations.[27]

The Board later decided to monitor closely the RANN program, specifically requiring that analyses should be made on progress of the program, that peer review procedures should be refined, and that the Programs Committee should continue to review each RANN award.[28] In April 1972, as a follow-up to the work of the Ad Hoc Committee on RANN Policy, the full NSB requested the Director to prepare plans to establish a systematic anticipatory plan to review RANN proposals, to establish a peer proposal review evaluation group, and to periodically review the program.[29] The Board did not delegate complete authority to the Director to manage the program until March 1973.[30]

The RANN program continued to be controversial. GAO and other groups studied the program in considerable depth and criticized such weaknesses as the appropriateness of the RANN mission to the NSF, the inability of NSF staff to manage applied and problem-oriented programs, the overlap with the work of other Federal agencies, and the effectiveness of RANN research utilization activities.[31] A committee on social sciences at the National Academy of Sciences, established at the request of NSF, criticized in particular RANN's social sciences activities, stating that the lack of social scientists in RANN program management positions precluded adequate NSF program development and proposal review.[32]

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[22] 136 : 10.
[23] Ibid
[24] ES : 141 : 5.
[25] ES : 142 : 6.
[26] ES : 141 : 5–6.
[27] 143 : 3–4.
[28] 146 : 18.
[29] ES : 146 : 3.
[30] 150 : 4, 151 : 4 ; 152 : 14, 154 : 9

C. CREATION OF THE APPLIED SCIENCE AND RESEARCH APPLICATIONS DIRECTORATE

The next major reorganization that occurred in NSF consisted of disestablishment of the RANN program and creation of a new Science and Engineering Directorate, eventually to be known has Applied Science and Research Applications (ASRA.) The major protagonist in this reorganization was the new NSF Director, Richard A. Atkinson, The Board's role, as in most NSF organizational matters, was one of reacting to a decision recommended by others. But in this case, the Board did act to delay the change and to convene an outside group to advise the Director. The following exchange, regarding a prior reorganization, is, in many respects, typical of the Board's frequent lack of contribution to decisions of this nature. At the Executive Committee meeting in February 1975, the Director informed the Committee of a personnel and organizational problem, which was not described, but which had arisen regarding a contemplated realignment in RANN of the Office of Intergovernmental Science and Research Utilization, Office of Experimental R and D Incentives, and Office of Systems Integration and Analysis.[33] At that same meeting the PPC Chairman, when reviewing the reorganization, complained that although the PPC had no specific recommendations, it "did suggest to the Director that, when organizational changes of potential significance are contemplated, the plan might be brought to the Board for information before final action." [34]

1. The Director's Plan to Link Applied Science and Engineering in One Directorate: June 1976

Many motives have been attributed to Dr. Atkinson's move to create a directorate which linked applied science and engineering, but the basic one seems to have been to relate the Foundation's problem-oriented and applied research activities to the basic research mission of NSF. During the Executive Committee session of the June 1976 meeting, the Director distributed a memorandum [35] to the Board giving considerable detail regarding "the proposed establishment of a new directorate composed of the Division of Engineering and the Directorate for Research Applications." In addition to announcing his plans, the Director said during the June meeting ". . . it would be highly desirable if the reorganization could be effective by the time the fiscal year 1978 budget is planned in the Fall."[36]

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[31] U.S. General Accounting Office. Opportunities for Improved Management of Research Applied to National Needs (RANN) Program, National Science Foundation, Nov. 5, 1975 (MWD–75–84) and U.S. General Accounting Accounting Office. National Science Foundation Actions on Recommendations of GAO Report "Opportunities for Improved Management of the Research Applied to National Needs (RANN) Program," Nov. 5, 1975, Mar. 15, 1977. (HRD–77–54.)

[32] U.S. National Academy of Sciences. Committee on the Social Sciences in the National Science Foundation. Social and Behavioral Sciences Programs in the National Science Foundation. Final Report. Washington, U.S. National Academy of Sciences, 1976.

[33] ES : 170 : 20–31.

[34] ES : 170 : 30–21.

[35] NSB/EC–76–20.

2. Creation of Advisory Committee to Study the Plan

During the same meeting, the Executive Committee "endorsed the general principle of the proposed merger," but it also formed a small group composed of Board and NSF staff members to "study the matter, to seek the views of the community, especially the engineering societies and industrial engineers and to recommend action to the Director and the Board in September."[37] The Acting Director concurred with this Board position, even though he had specified the outlines of the change that he desired in June 1976. Apparently he felt that a broadly constituted task force should be created to examine options and very possibly to generate consensus for his decision. The directorship was in flux. Director Stever had left in August 1976; Dr. Atkinson was Acting Director until May 1977, when he was named Director. In late 1976, Dr. Atkinson and the Board established a task force to review applied research and problem-focused research in NSF. The participants in this decision coined a new term, "science applications," to encompass both applied research and problem-focused research and named a task force called the Science Applications Task Force in December 1976.[38] No members of NSB were on the Task Force, although, at the October 1976 meeting, the Acting Director distributed a draft charter and a list of possible members, seeking reactions from the Board.[39]

Dr. Atkinson outlined his reorganization plan at the outset of the group's work. In its final report the task force discussed six options for reorganization. Although it did not recommend any one preferred model, according to Mogee "its comments indicated [two] were the leading contenders."[40] Neither of these models contained all the elements Dr. Atkinson had preferred. The basic difference was that he wanted the Foundation's engineering programs to be combined with RANN to form a new directorate called "Engineering and Applied Science."[41]

3. Creation of ASRA Directorate

On August 17, 1977, Dr. Atkinson recommended the establishment of a Science Applications Directorate. According to the Board minutes, his recommendation closely paralleled the second of the two models that the Task Force preferred.[42] The organizational structure called for a remodeled RANN with its activities coupled more closely to the basic research directorates and to STIA. The engineering division was not to be combined with RANN, but was to remain in the basic research directorate for Mathematical and Physical Sciences and

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[36] 183 : 9.

[37] Idem.

[38] Mogee, 1978, op. cit., p. 10.

[39] 185 :16. However, Dr. Joseph H. Pettit, who would later become a member of the Board, was a member of the group. (Mogee 1978 op. cit., p. 36.)

[40] Mogee, 1978, p. 16.

[41] Mogee, 1978, op. cit., citing U.S. National Science Foundation. Summary Minutes of the First Meeting on the Science Applications Task Force. p. 3.

[42] Apparently the task force preferred a model which would have reorganized all of NSF's functions into three areas of basic sciences, applied sciences, and science applications, (CS :192 :5.) Mogee wrote that Atkinson's decision was based also on "suggestions from a number of other sources (earlier GAO studies, Academy of Sciences reports and discussions involving the National Science Board, the Foundation's congressional leadership, representatives of OMB and other executive agencies." (Mogee, 1978, op. cit., p. 17.)

Engineering. During its September 1977 meeting, the National Science Board received an interim report from Dr. John R. Whinnery, the head of the task force. Then, with virtually no discussion, the NSB approved the recommendations that Dr. Atkinson had submitted. The new Directorate was not created until February 6, 1978, when the final report of the Science Applications Task Force was released. The new Directorate consisted of four divisions; most of the RANN program activities were retained in the new Directorate.[43]

The new directorate originally was to be called the Science and Engineering Applications Directorate; however, subsequently its name was changed to the Applied Science and Research Applications Directorate (ASRA).

In a presentation before the Board in September 1977, the Directorate's head, the former deputy director of RANN, explained that both basic and applied research would be supported. But the basic goal of the directorate would be to "foster growth of fundamental scientific understanding and capability in areas perceived as having highest relevance, and to focus resources more directly on selected problem areas which have a shorter term potential for payoff." NSF would hope to fund an effort "to the point where it can be transferred to another mission agency."[44] The minutes indicate that the Board spent little time discussing the reorganization. One question was asked regarding the propriety of NSF forcing the direction that basic research would take. The staff indicated that this was a deliberate objective of the program. Then it was reported:

> Dr. Hackerman expressed the Board's appreciation to Dr. Sanderson for his presentation and stated that the Board would be following with interest the activities of the reorganized [Directorate].

D. CREATION OF THE ENGINEERING AND APPLIED SCIENCES DIRECTORATE (EAS)

Two more major changes have occurred in the applied research support area since 1978. Both signify development of an evolutionary structure which strengthens engineering as a basic research discipline and weakens the position of applied research in NSF, submerging it back into research Directorates to almost the same position it had before RANN was created.

1. *Objectives of Creating EAS*

The first change occurred in July 1979 when the name and organizational structure of ASRA was changed to coincide almost perfectly with the organizational model that Dr. Atkinson had recommended in 1976. That is, the Applied Science and Research Applications Directorate was merged with the Engineering Division to form the Directorate for Engineering and Applied Sciences. Dr. Jack Sanderson who had been the head of ASRA was named head of the new directorate. The objective of the move, according to Dr. Sanderson, was to improve the application of science and technology to solve problems of social concern. He testified that this move recognized "a unique role of NSF in fundamental engineering sciences and in providing the bridge between basic research and application."[45] He said specifically:

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[43] Mogee, 1978, p. 24, and CS:192.

[44] 193: 18–19.

> By combining these organizations, NSF is now better able to:
>
> Strengthen the engineering programs of the Foundation by giving them a single, more visible place in the NSF organization;
>
> Enhance NSF's program of applied and problem-focused research by providing a broader base of science and engineering on which to build; and
>
> Recognize the key role of engineering in the transfer of science into technology by placing the Foundation's major engineering, industry-related, and problem-oriented efforts in one organization.[46]

It appears that the NSB, as in the case of ASRA, played little or no role in this decision. The first time that this reorganization was mentioned again (the Director had called for it in 1976) was during the Executive Committee meeting of December 1978, when he told the Committee that he was planning a reorganization which would have renamed the ASRA Directorate as the Directorate for Engineering and Applied Sciences. He indicated that the move would not have transferred the Engineering Division out of the Directorate for Mathematics, Physics, and Engineering to the new EAS, but instead would have moved the support of astronomy, including National Research Centers in astronomy, from the Astronomical, Atmospheric, Earth, and Ocean Sciences (AAEO) Directorate to a new directorate for Mathematics, Physics, and Astronomy, to which the materials research laboratories also would be moved. Apparently the Director believed that the move would equalize the size of the directorates and would have enlarged the base of support for each area.[47]

2. *Criticism of the Plan*

The discussion by the members of the Board's Executive Committee indicates that the contemplated move would be in line with the intent of the Science Applications Task Force, but that it might mean that in time an engineer might be named an Assistant Director of a new Directorate for Mathematics, Physics, and Astronomy (MPA), to satisfy the engineers. This apparently was not acceptable to some basic research scientists. Another objection was that "some members of the materials community . . . expressed displeasure with plans for the amalgamation of the Materials Research Laboratory activity, much of which it considers to be basic research, with the applied activity."[48]

The minutes also indicate that "There ensued considerable discussion of the plans with views being expressed both in favor and in opposition. Among others, it was argued that engineers might tend to dominate the new directorate and overwhelm the applied program."[49] Apparently the NSB Chairman wanted the Director to discuss reorganization plans at the January meeting,[50] but the discussion was delayed due to the considerable pressure being applied from the scientific community and from within the Foundation.

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[45] U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. 1981 National Science Foundation Authorization. Hearings on H.R. 6728, Feb. 1980. 96th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 1980. p. 390.

[46] Ibid., p. 397–398.

[47] EC: 78–11–7.

[48] EC: 78–11: 6–7–8.

[49] EC: 78–11: 8.

[50] Idem.

In closed session the Board discussed the pros and cons of such a consolidation. The following points were expressed, among others:

1. Concern that the focus of the Congress on innovation and applied research would erode basic research in engineering if it were consolidated into an applied science area of the Foundation.
2. The assertion that the Directorate for MPE, because of the nature of NSF and its enabling legislation, the makeup of its constituency, and the role it plays in the scientific community, lies at the core of the Foundation's basic science authority and responsibility, and that the Division of Engineering now clearly benefits from its association with MPE.
3. The impression that, because of the nature of Congressional support for problem-focused research, it may be more stable by association with a group which has stature in the applied science area.
4. The assertion that many top quality engineering faculty whose research tends to be more applied than basic no longer apply to the Foundation for funds, but instead seek support for their basic engineering research from other sources. It was hoped that this group would again turn to NSF under the new directorate.
5. The belief that administrative organizations are historic accidents and are best derived from experience and that the only way to determine if an administrative structure is appropriate is by experience.[51]

3. Director Creates EAS

In a demonstration of authority that would be seen again in 1980, the Director, who seemed quite anxious to make the contemplated move, told the Board, after consulting with its members, that he would go ahead with it since matters of reorganization are totally within his purview. The minutes report as follows:

> Section 8 of the NSF Act states that: "There shall be within the Foundation such Divisions as the Director, in consulation with the Board, may from time to time determine." Hence, the Director did not ask for action by the Board on this matter. However, it was the general consensus of the discussion that the plan was generally satisfactory to the Board.[52]

The reorganization, a compromise, was announced on May 29, 1979. All the functions of the former ASRA Directorate were combined with engineering to form the Engineering and Applied Sciences Directorate (EAS). Materials Research Laboratories were not moved from the Directorate for Mathematics, Physics, and Engineering (MPE), which was renamed the Directorate for Mathematics and Physical Sciences (MPS).

E. CREATION OF A SEPARATE DIRECTORATE FOR ENGINEERING

1. Introduction

The next major change to occur took place in 1980. It accords engineering status as a separate directorate, and resubmerges applied science back into the scientific research program support directorates, recreating for applied science the kind of secondary status accorded to this area before the creation of RANN, but giving engineering considerably enhanced status. Several motives have been attributed to the move. Foremost is that the reorganization was made largely as a defensive reaction to thwart the proposal, introduced by Representative George Brown as Chairman of the Subcommittee on Science, Research, and Technology of the House Science and Technology Committee, NSF's House authorizing committee, to create a National Technology Foundation which would have assumed some of NSF's responsibilities. Another equally compelling explanation is that the reorganization was responsive to an intense lobbying effort being made by engineers encouraging the NSF to give more attention to engineering as a basic science so as to improve the environment for teaching and research in engineering departments, which apparently had become seriously eroded due to the movement of engineering faculty to higher paying industrial jobs.[53]

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[51] CS : 206 : 4–5.
[52] CS : 206 : 5.

In contrast to previous reorganizations where it played only a small role, the Board spent considerable time dealing with this reorganization. The Board's level of interest seemed caused as much by the saliency of the issue (or the perceived threat), as by the absence of leadership in NSF. (NSF Director Atkinson resigned in June 1980, the new NSF Director was not confirmed until September, was not sworn in until December, and did not assume his role, full time, until the beginning of 1981.) There was also a new Deputy Director, beginning in July 1980. Despite the amount of time the Board spent on the issue, its role seemed to be one mainly of securing support from the scientific community for a decision that the NSF Director had already made. But since it took the Board about a year to agree to the Director's decision, NSB action seemed somewhat obstructionist and served to delay implementation of the Director's decision, whose basic outline was not ever changed.

2. *The Proposal to Create a National Technology Foundation*

Representative George E. Brown, Jr. introduced the proposal to create a National Technology Foundation (NTF) on March 25, 1980, basically to coordinate and enlarge the fragmented Federal Government efforts relating to technological innovation and activities intended to hasten production of knowledge needed for technological development. NTF would have been an independent agency with eight main branches for: (1) small business, (2) institutional and manpower development, (3) technology policy and analysis, (4) intergovernmental technology, (5) engineering, (6) national (problem-focused) programs, (7) the National Bureau of Standards, and (8) the Patent and Trademark Office and National Technical Information Service. The agency would have funds and program responsibilities transferred, mainly from the Department of Commerce and the National Science Foundation. NTF would have had a substantial budget: the bill contained authorizations for fiscal years 1981 of $500 million; 1982, $690 million; and 1983, $875 million. Its governing structure was based on the NSF model and would include a National Technology Board, six to eight of whose members would overlap with the membership of the National Science Board. Among the programs that would be transferred from NSF would be all basic research in engineering, constituting almost all of engineering and all applied science.[54]

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[53] Greenberg, Daniel S. Engineering Neglected by the Washington Bureaucracy. Chicago Tribune, Dec. 6, 1980: 12 and Reinhold, Robert. U.S. Science Agency Plans a Shift to Engineering and Practical Study. New York Times, Nov. 21, 1980: A1, A24.

3. The NSB Response: Creation of a Study Committee and Discussion of the Director's Alternative Proposal to Create an Engineering Directorate

The National Science Board was presented with a copy of the draft legislation in January 1980.[55] At the February 1980 meeting of the Planning and Policy Committee, NSB member Pettit, who is an engineer, reported that the plan would be a serious mistake,[56] and that NSF was already supporting some of the areas of "national concern" listed in the preamble to the legislation. The chairman of the PPC established a PPC Subcommittee on Issues Asociated with the Proposed NTF, composed of Dr. Pettit as chairman, Dr. Bisplinghoff, and Dr. Branscomb to draft a statement on issues associated with the proposed foundation, that is, a description of areas already supported by NSF, consequences of transferring functions from NSF, and so on, so that the PPC could subsequently present recommendations to the Board for action. Dr. Hubbard also noted that many of the issues of concern transcended the NTF issue and also affected on-going NSF programs and might warrant study from that perspective.

The Board added this subject as a topic to the June long-range planning meeting (Task Force 80–C on "Issues Associated with the Proposed National Technology Foundation", chaired by Dr. Pettit) because of the broader issues involved. The task force reported that NSF had responsibility to support engineering, that "science-driven" applied research was clearly suitable for NSF support, and that NSF should support "problem-driven" applied research if no other agency supports it. It also stated that NSF Director Atkinson suggested that NSF should respond to the NTF proposal by "creating an Engineering Directorate to give clear visibility to engineering, and distributing applied research throughout the relevant disciplines withn NSF." During the full June NSB meeting, which discussed the report, the Director made the following additional proposals:

> NSF should increase its resources for engineering research;
>
> Applied research and problem-focused research in the current Directorate for EAS should be distributed throughout the Foundation;
>
> The Industry-University Cooperative Research Program, which is already distributed throughout the Foundation should continue to have that character. . . .
>
> The Small Business Program and the Intergovernmental Science Program have no unique relationship to engineering research; their transfer to the Directorate for STIA should be considered.[57]

The Director also proposed that consideration should be given to establishing a Social Sciences Directorate and an Office of Applied Research that would monitor and coordinate the applied research programs of the various directorates.

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[54] Brown, Hon. George E., Jr. National Technology Foundation Act of 1980. Extension of remarks. Congressional Record, daily ed., Mar. 25, 1980: E1486–E1489.

[55] PPC meeting No. 64, Jan. 17, 1980.

[56] PPC meeting No. 65, Feb. 20, 1980.

[57] 217 : 17.

4. Delay Caused by Further Study and Consensus Building

The Task Force endorsed the basic plan that the Director set forth and decided to recommend to the full NSB that the Director undertake a study to see how such changes could be made with the intent that a plan be brought to the Executive Committee meeting in July and to the full Board in August.[58] The Director wanted to complete the reorganization before submitting the fiscal year 1982 budget to the Congress.

Both Dr. Branscomb and Dr. Pettit prepared separate papers distributed at the June meeting which endorsed the notion of NSF support for engineering research.[59] But both Director Atkinson and Deputy Director Pimentel resigned effective at the end of June. The new Deputy Director was forced to serve as Acting Director until the end of the year, when the new Director took the oath of office. This temporary lack of leadership seems to have fostered indecision about implementing the reorganization.

During August 1980, the Board Chairman reported that the June meeting's discussion of engineering and applied science resulted in "some important ideas and principles [apparently released as NSB–79–80, distributed at the meeting] which could be tested most effectively by asking the Director to provide a proposal as to how these objectives might best be organized and managed. The Board also requested a statement of policy intent which could serve as a preface to the discussion of implementation of these objectives." [60] The Acting Director presented a draft document which he said reflected the NSF history and incorporated not only the June discussions, but changes suggested by the PPC.[61] This was entitled "Organizational Philosophy and Rationale," dated August 12, 1980.[62] The Chairman asked the Board members to comment on it. Basically the document reflected the notion that it is difficult to differentiate basic from applied research when determining policy and support mechanisms. More important is the time element: the distinctions of short-term and long-term research should be made on the basis of when applications can be anticipated. Engineering is as fundamental a science as other disciplines, and it was so important as to warrant attention in a separate Directorate, which supports both basic and applied research. Applied research should be desegregated from the rest of NSF programs and amalgamated into the other disciplinary directorates. But new peer review and advisory committee mechanisms should be established to deal with applied research.[63]

It was stated often in Board discussions that the "Organizational and Rationale" philosophy document and the NSF reorganization proposal were not "a response to the proposed National Technology Foundation and should not be so construed." Dr. Pettit, for instance, is reported as having remarked that "he believed it to be a partial reaction to some issues raised in examining the possible effects of the transfer of certain NSF activities to the proposed NTF, i.e., what was appropriate about those activities within NSF and how such activities would fare if they were transferred from NSF."[64] However, it appears that the Board's and Foundation's activities were intended, at least in part, to mitigate the proposed effects of the bill.

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[58] Report of Discussion Group 80–C. Issues Associated with the Proposed National Technology Foundation. Appendix (Revised attached to NSB–80–289). 217: 21 and 217: 17.

[59] 217: 9–10 and Appendix A of Testimony of Dr. Lewis M. Branscomb, Chairman, National Science Board, National Science Foundation on H.R. 6910, National Technology Foundation Act of 1980, before the Subcommittee on Science, Research, and Technology, Committee on Science and Technology, Sept. 8, 1980.

[60] NSB–80–325.

[61] 218: 13.

[62] 218: 17.

[63] NSB–80–35, and NSB–80–358 (a revised version of NSB–80–325) and Walsh, John. NSF Under Challenge from Congress, Engineers, Science, v. 209, Sept. 26, 1980: 1499.

During early September 1980, the Subcommittee on Science, Research, and Technology of the House Committee on Science and Technology held hearings on the bill. Witnesses disagreed about the merits of the proposal. According to a report in *Science*, engineering societies enthusiastically supported an NTF or a measurably larger role for engineering in NSF:

> Major engineering societies see NTF as one alternative in their quest for greater federal recognition of the claims of engineering research and training. The International Institute of Electrical and Electronics Engineers and American Association of Engineering Societies, the largest professional grouping of engineers, have adopted resolutions on the matter. The options put forward by the engineers call for creation of an NTF, a major overhaul of NSF with the effect indicated by a name change that includes engineering, or establishment of a free-standing engineering foundation.[65]

Dr. Lewis Branscomb, testifying for the National Science Board opposed the creation of NTF:

> I agree with the bill's recognition of the importance of engineering and applied research, but I do not believe that the organizational separation of these technical fields from mathematical, physical, biological, and the social sciences is wise or necessary. I do believe research and education support for our long-range scientific and engineering capabilities can be in an organization separate from the agencies concerned with other research and development activities involving industry, since the Office of Science and Technology Policy is available to coordinate their activities as well as those of the mission agencies.[66]

5. The Public Relations Role of the Board

The Board appears to have played a major public relations role in subsequent activities relating to the reorganization, especially with respect to communicating with representatives of most major scientific disciplines to discuss pros and cons of the reorganization and to lobby against creation of the NTF and in favor of restructuring of NSF's organization and programs so that it would not lose any of its responsibilities. For instance during meeting 218, Dr. Hogness, speaking for the PPC, said that the Committee enthusiastically supported creation of a separate engineering directorate and that "There was also agreement that much, but not all, of the applied research currently being supported by the Foundation probably would remain in that Directorate." But the PPC also stated that some applied research should be moved to other directorates and that some would interpret this move as "an attempt to deemphasize support of applied research," which was not intended. The NSB minutes indicate that the Board suggested ways to clarify this point, especially by changing review procedures in some directorates.[67] Dr. Pettit suggested creation of an applications office at the Director's level to monitor the applied responsibilities across the Foundation.[68] Subsequently the Acting Director recommended that the Board consider establishing an oversight committee to monitor the balance between basic and applied research in the NSF, in part to placate those elements of the community who felt that either basic or applied research would be disadvantaged if applied research were distributed throughout NSF.[69]

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[64] 218 : 18.

[65] Walsh, John, NSF Under Challenge from Congress, Engineers, Science, v. 209, Sept. 26, 1980 : 1499.

[66] Testimony, op. cit., p. 4.

During a meeting with the NSB Executive Committee on July 18, Congressman Brown, invited to present his views to the Board, said that the Foundation seemed to lack a capability to deal with applying science and technology to certain kinds of situations. In response, the Board Chairman said that "he believes the Foundation needs to deal more effectively than it has with the translation of basic knowledge into ultimate public benefits. He said that there is a bigger conceptual gap between activities in engineering and those in technology than there is between engineering or fundamental research and applied research." [70] The Board subsequently suggested several word changes in the philosophy statement to deal with these issues—for instance, replacing the phrases "difference between 'basic and applied' " with "difference between 'short and long term' ". Related to this, the Vice Chairman suggested that an office be established in NSF to deal with national needs issues analyses and reports requested by Congress and OSTP. "Such Office might try to address the needs directly through problem-focused research or consult with industrial, academic, and Government representatives. . . ." [71]

6. Additional Reorganization Proposed

During the next meeting, the Deputy Director, who was serving as Acting Director, proposed a restructuring of STIA [72] and changes in the support of some education programs. Some Board members opposed those parts of the restructuring which would have moved some of the science education programs, for example, Science for Citizens and Ethics and Values in Science and Technology, from the Science Education Directorate on the grounds that they would be weakened intellectually.[73]

Also during this meeting, the Acting Director proposed an additional reorganization to create a separate Directorate for Social, Behavioral and Neural Sciences, or a separate Directorate for Social Sciences. During the discussion, Dr. Hackerman noted that "excessive time should not be taken in considering a reorganization; and . . . the more elements that enter into the consideration of a reorganization, the more difficult it is to get them accepted; therefore, he recommended that the reorganization should concentrate only on the engineering matter." Subsequently, after conferring with various scientific groups, the Director-designee withdrew the proposal to create a separate Directorate for Social Sciences.[74]

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[67] 218 : 18. August 1980.
[68] 218 : 20.
[69] 219 : 15.
[70] 218 : 19.
[71] 218 : 21.
[72] 219 : 15.
[73] 219 : 15–16.

7. *Continuing Board Delays*

During the next few meetings, as the NSF Director firmed up the reorganization plan, the Board dealt with the following issues:

—personnel implications of the proposed reorganization on NSF and whether or not the Board should seek additional authority for more presidentially appointed assistant directors (to equalize the balance of support); [75]

—meetings between the Board and NSF staff wih disciplinary representatives to seek guidance or approval regarding aspects of the reorganization. For instance, the Acting Director and some Board members met with the Advisory Committee for Information Science and Technology; the Acting Director and a Board member met with all NSF advisory committee chairmen at a meeting held at the Foundation; [76] and

—discussions with members of the engineering profession which revealed their misgivings that the reorganization would not go far enough to support their demands and that engineers should be supported in another agency.[77]

The Board continued to discuss the reorganization at the October Board meeting during which the new Director-designee, Dr. John Slaughter, was present. But it was apparent that the Acting Director had not made any final moves to reorganize because the Board had not indicated complete approval and the fact that the new Director-designee had not started work. The Board's major concern apparently related to revising the Foundation's basic science and applied research mission significantly to recognize its responsibility to support engineering research on a massive scale.

The Acting Director's and the Director-designee's apparent exasperation with the Board's inaction on the reorganization became evident at the October meeting when the Chairman of the Board distributed to the members a memorandum prepared by the NSF General Counsel that indicated that while the Board clearly shares responsibility with the Director for deciding the policy framework for action with respect to the reorganization, no formal Board action is required on organizational matters.[78] However, since the NSF Act, as amended in section 8, states that "There shall be within the Foundation such Divisions as the Director, in consultation with the Board, may from time to time determine," the Director-designee and the Acting Director sought at this meeting once again to obtain advice from the Board, in particular the Board's approval and clearly articulated commitment to engineering.[79]

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[74] 219 : 15. But in anticipation of recommending this change, the Director's office held a meeting to gauge the reactions of leaders of the social science disciplines, coordinated by the Social Science Research Council (SSRC). Dr. Friedl, an anthropologist and one of the few social scientists on the NSB, attended the meeting with the SSRC and reported to the Board that the social scientists seemed divided on the issue. While some supported the reorganization, others said they opposed the move since the disciplines would be too visible and vulnerable to public criticism, and that applied science support might drive out basic science support. (219 : 13–14.)

At meeting 220, Dr. Langenberg reported to the Board that the neurosciences community specifically objected to the proposal on the grounds that the neural sciences were more closely related to the biological sciences area than the social sciences area. Therefore he changed his views, but said, nevertheless, that in 1981 he would pursue his recommendation to create a separate Directorate or other mechanism to support the social sciences. (220 : 26–27.) At the November 1980 meeting, new Director-designee John Slaughter, who had been confirmed, but not sworn in, probably pending approval by the new President, said he had decided that it did not appear to be in the Foundation's best interest to establish now a Directorate for Social Sciences, especially if this meant separating the biological and behavioral sciences." (221 : 9. See also: Walsh, John. NSF Boosts Engineering. Applied Research. Science, v. 210, Dec. 5, 1980 : 1105–1106.)

[75] CS : 219 : 5.

[76] 219 : 11–12.

[77] 219 : 15.

[78] 220 : 25.

During the November meeting the Board discussed the proposal to distribute applied research throughout the Foundation and noted that Rep. Brown believed that the plan should be considered experimental since the Foundation had successful experience in managing some integrated applied research programs, should not permit these to suffer, and might find similar arrangements appropriate for other areas of applied research.[80] The Board apparently agreed with this position.

In an effort to quell the Board's fears that applied research might suffer, at the next meeting the Director-designee discussed options that he was considering to ensure that applied research was appropriately managed, such as establishing a mechanism within each directorate to oversee interdisciplinary and problem-focused research. The Board responded that the proposed office might function more effectively if it reported to the Director or the Deputy Director.

During the November Board meeting the Director-designee announced the proposed reorganization and that he recommended that the Acting Director initiate it.[81] The next day, November 21, 1980, the Foundation issued a press release announcing its "intention to establish a directorate for engineering and to change its method of managing applied research." The details were the same as those the Director-designee announced at the Board meeting. The press release noted that "the Foundation will assure that its ability to support interdisciplinary and problem-focused research is not compromised."[82] On the critical issues of creating an engineering directorate and distributing applied research, the plan was identical to the proposal that Director Atkinson had drawn up earlier in the spring of 1980. However, apparently changes were not to be made in STIA or in Science Education as requested, see table 19.[83]

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[79] 220 : 25–28.

[80] 220 : 28.

[81] 221 : 8.

[82] NSF Announces Intent to Reorganize, November 21, 1980. (NSF–PR–80–101.)

[83] As interpreted from the Revised Structure, FY 1982 Budget to Congress, Dec. 10, 1980. During the November 1980 meeting, Dr. Slaughter outlined the details of the reorganization :

(1) establish a Directorate for Engineering,

(2) distribute responsibility for the support of applied research programs throughout the Foundation, for both disciplinary and interdisciplinary research, by assigning the appropriate Assistant Directors each with the responsibility for developing mechanisms whereby applied research can be supported within the framework of the respective Directorates ; and

(3) restructure the Directorate for Biological, Behavioral, and Social Sciences, to include :

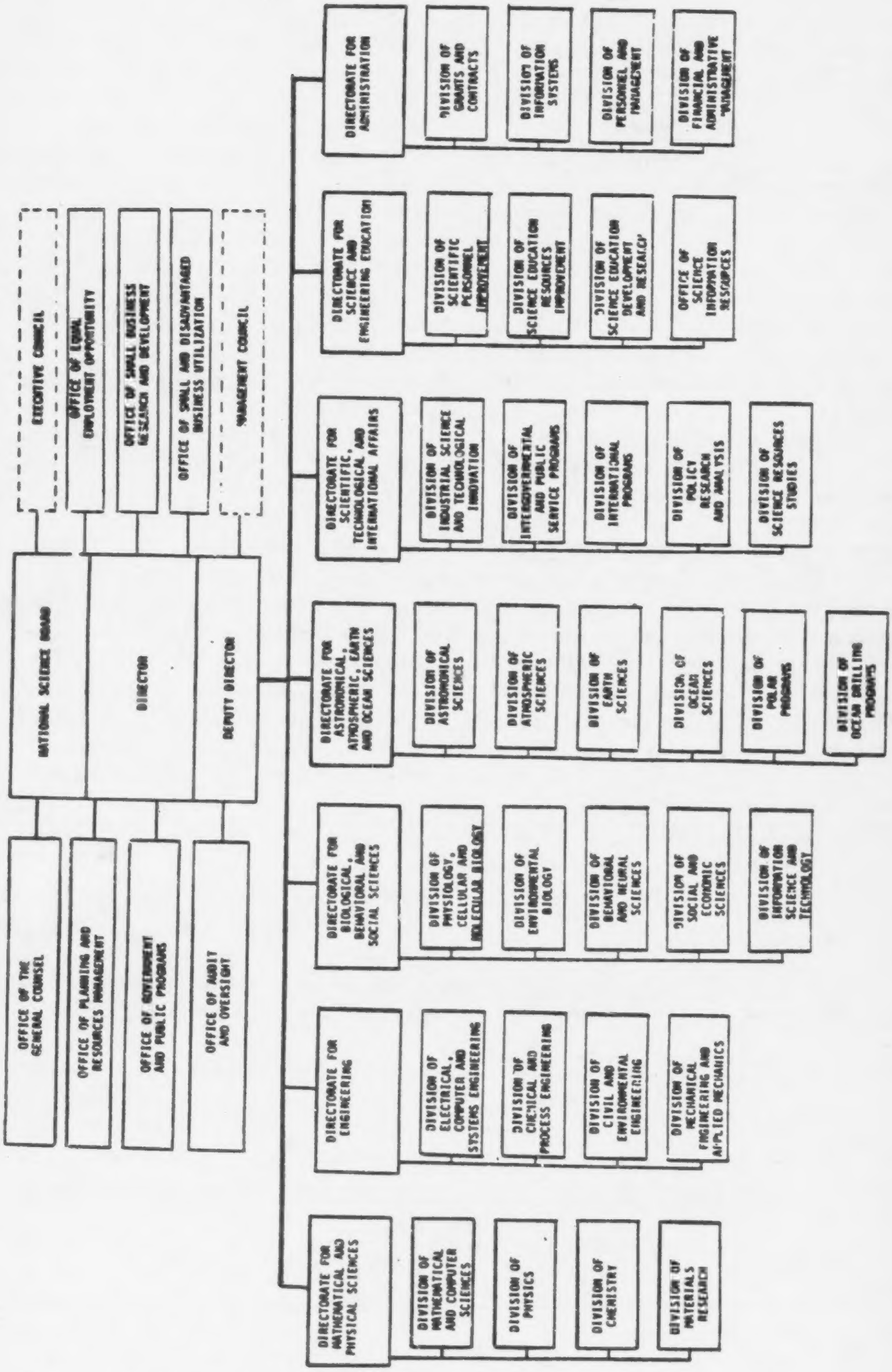
(a) applied social science programs currently within the Directorate for Engineering and Applied Science ;

(b) information science and technology programs currently within the Directorate for Scientific, Technological, and International Affairs ; and

(c) the new Decision and Management Sciences Program. (221 :8.)

The reorganization was effective March 8, 1981. (National Science Foundation Reorganization Announced. Mar. 4, 1981. NSF PR 81–19.)

TABLE 19. Organization of NSF, March 1981


NATIONAL SCIENCE BOARD
DIRECTOR
DEPUTY DIRECTOR
EXECUTIVE COUNCIL
OFFICE OF EQUAL EMPLOYMENT OPPORTUNITY
OFFICE OF SMALL BUSINESS RESEARCH AND DEVELOPMENT
OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION
MANAGEMENT COUNCIL
OFFICE OF THE GENERAL COUNSEL
OFFICE OF PLANNING AND RESOURCES MANAGEMENT
OFFICE OF GOVERNMENT AND PUBLIC PROGRAMS
OFFICE OF AUDIT AND OVERSIGHT
DIRECTORATE FOR ADMINISTRATION
DIVISION OF GRANTS AND CONTRACTS
DIVISION OF INFORMATION SYSTEMS
DIVISION OF PERSONNEL AND MANAGEMENT
DIVISION OF FINANCIAL AND ADMINISTRATIVE MANAGEMENT
DIRECTORATE FOR SCIENCE AND ENGINEERING EDUCATION
DIVISION OF SCIENTIFIC PERSONNEL IMPROVEMENT
DIVISION OF SCIENCE EDUCATION RESOURCES IMPROVEMENT
DIVISION OF SCIENCE EDUCATION DEVELOPMENT AND RESEARCH
OFFICE OF SCIENCE INFORMATION RESOURCES
DIRECTORATE FOR SCIENTIFIC, TECHNOLOGICAL, AND INTERNATIONAL AFFAIRS
DIVISION OF INDUSTRIAL SCIENCE AND TECHNOLOGICAL INNOVATION
DIVISION OF INTERGOVERNMENTAL AND PUBLIC SERVICE PROGRAMS
DIVISION OF INTERNATIONAL PROGRAMS
DIVISION OF POLICY RESEARCH AND ANALYSIS
DIVISION OF SCIENCE RESOURCES STUDIES
DIRECTORATE FOR ASTRONOMICAL, ATMOSPHERIC, EARTH AND OCEAN SCIENCES
DIVISION OF ASTRONOMICAL SCIENCES
DIVISION OF ATMOSPHERIC SCIENCES
DIVISION OF EARTH SCIENCES
DIVISION OF OCEAN SCIENCES
DIVISION OF POLAR PROGRAMS
DIVISION OF OCEAN DRILLING PROGRAMS
DIRECTORATE FOR BIOLOGICAL, BEHAVIORAL AND SOCIAL SCIENCES
DIVISION OF PHYSIOLOGY, CELLULAR AND MOLECULAR BIOLOGY
DIVISION OF ENVIRONMENTAL BIOLOGY
DIVISION OF BEHAVIORAL AND NEURAL SCIENCES
DIVISION OF SOCIAL AND ECONOMIC SCIENCES
DIVISION OF INFORMATION SCIENCE AND TECHNOLOGY
DIRECTORATE FOR ENGINEERING
DIVISION OF ELECTRICAL, COMPUTER AND SYSTEMS ENGINEERING
DIVISION OF CHEMICAL AND PROCESS ENGINEERING
DIVISION OF CIVIL AND ENVIRONMENTAL ENGINEERING
DIVISION OF MECHANICAL ENGINEERING AND APPLIED MECHANICS
DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES
DIVISION OF MATHEMATICAL AND COMPUTER SCIENCES
DIVISION OF PHYSICS
DIVISION OF CHEMISTRY
DIVISION OF MATERIALS RESEARCH

Source: NSF Press release 81-19, Mar. 4, 1981.

Despite the persuasive campaign of the Director and the Board, there is still opposition to the reorganization, especially from some academic scientists who apparently believe that engineering and applied research, which now receive about ten percent of the NSF budget, will enlarge so that they will consume too much of the budget, disadvantaging the basic research disciplines. Also, some engineers continue to urge that engineering should be supported mainly by mission agencies, such as the Departments of Defense and Energy [84] or by a separate technology or engineering foundation.

In addition, it has been reported that Representative Brown's staff believes that the NSF reorganization plan does not satisfy the intent of the NTF bill. It was reported in *Physics Today* that a staff member noted that "the NSF proposal does not really address the most important issues. The Brown bill would build up problem-focused applied research, he told us, whereas the NTF proposal would have the opposite effect of breaking it up and distributing the pieces over the entire foundation. "NSF digests anything that isn't basic research and converts it, through its own metabolic processes, into basic research," he said.

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[84] Reinhold, Robert. Doubts Greet U.S. Plan to Aid Engineering. The New York Times, Nov. 25, 1980 : C2.

XI. MEMBERSHIP OF THE NATIONAL SCIENCE BOARD

The following is a summary of the method of selection of National Science Board members, followed by an analysis of several characteristics of the present and past membership of the Board.

A. Selection of Board Members

As specified in section 4 of the National Science Foundation Act, the Board consists of 24 part-time members appointed by the President, by and with the advice and consent of the Senate, and of the Director ex officio. Board members serve six-year term appointments, eight of which expire on May 10th of each even year. Members reappointed to serve a second six-year term become ineligible for appointment during the two-year period following their second consecutive term.

In making nominations to the National Science Board, the Board and the Director of the National Science Foundation seek recommendations on behalf of the President from the major scientific, engineering, and educational societies and associations, as provided in section 4(c) of the Act. Letters soliciting recommendations are sent to these organizations. A notice is also published in the *Federal Register* and the *NSF Bulletin*. As a result of this process, the Board receives many names, all of which are transmitted to the White House for the President's consideration. During the search for nominees to replace those members whose terms expired in May 1978, 31 societies and organizations were contacted, and over 400 names were received from them and a variety of other sources. These recommendations came from the scientific and educational communities, the Congress, NSF advisory bodies and staff, and the general public.

The announcement and solicitation process begins in the spring preceding the year in which vacancies will occur. The Board receives and reviews recommendations throughout the summer. For purposes of this review process, the Board makes use of an Ad Hoc Committee on National Science Board Nominees, which is given the responsibility of considering and recommending to the Board, for submission to the President, candidates to fill vacancies on the Board. Late in the year all recommendations received from all sources are forwarded to the White House for consideration together with the joint recommendations of the Board and the Director. These latter recommendations are transmitted in the form of two lists of eight names each. The President customarily submits most of the Board's recommendations to the Senate for confirmation.

In formulating its recommendations, the Board considers many factors, including those specified in the National Science Foundation Act of 1950, as amended. Section 4(c) of the Act requires that the persons nominated for appointment as members of the Board shall be:

(1) eminent in the fields of the basic, medical, or social sciences, engineering, agriculture, education, research management, or public affairs;

(2) selected solely on the basis of established records of distinguished service; and

(3) so selected as to provide representation of the views of scientific leaders in all areas of the Nation.

In addition, section 4(c) was amended in 1980 to require that, in making nominations for Board membership, the President "shall give due regard to equitable representation of scientists who are women or who represent minority group." [1] This new requirement was formulated by the Senate Committee on Labor and Human Resources to "assure that the National Science Board will continue to be a broadly representative and balanced advisory body" in light of the committee's finding that "scientists with one or both of these backgrounds are currently severely underrepresented in the U.S. scientific personnel pool" and the committee's concern that "such underrepresentation not be reflected in the Science Board." [2] Other factors considered by the Board in arriving at its recommendations include balance among professional fields, management capability, and representation of various types and sizes of industry, research organization, and educational institution. The Senate Committee on Human Resources stressed the latter factor in reporting the National Science Foundation Authorization Acts for fiscal years 1978 through 1980. In these reports the committee urged the National Science Board to include in its recommendations for new Board members the names of non-scientists and pre-college science educators for the reason that "the expertise of such persons could contribute significantly to the Board particularly in matters affecting public understanding of science and science education at the elementary and secondary school level." [3] The recommendations reported by the Senate Committee, however, do not have the force of law, as recently stressed by President Carter.[4]

In addition to the recommendations made via the Board, and the joint recommendations of the Board and the Director, recommendations are made directly to the President by Members of Congress and by other interested individuals and organizations. From this array, the President then makes a selection and submits his nominations to the Senate for confirmation by the usual nomination procedure.[5] Senate State delegations usually are polled before nominations are sent up to the Hill.

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[1] Public Law 96–516, Dec. 12, 1980.

[2] U.S. Congress. Senate. Committee on Labor and Human Resources. National Science Foundation and Women in Science Authorization Act for Fiscal Years 1981 and 1982; report to accompany S. 568. Washington, U.S. Govt. Print. Off., 1980. (96th Cong, 2d Sess, Senate Report No 96–713) p. 31.

[3] U.S. Congress. Senate. Committee on Human Resources, National Science Foundation Authorization Act of 1978; report to accompany S. 855. Washington, U.S. Govt. Print. Off., 1977. (95th Cong., 1st Sess., Senate Report No. 95–93) p. 43; and U.S. Congress. Senate. Committee on Human Resources. National Science Foundation Authorization Act for Fiscal Years 1979 and 1980; report to accompany S. 2549. Washington, U.S. Govt. Print. Off., 1978.

[4] Weekly Compilation of Presidential Documents. v. 16. Dec. 15, 1980, p. 2804–5, National Science Foundation Authorization and Science and Technology Equal Opportunities Act. Statement on signing S. 568 into law. Dec. 12, 1980.

[5] Information on the nomination of National Science Board members has been drawn from testimony by Norman Hackerman, Chairman of the National Science Board, appearing in U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research and Technology. Review of the National Science Foundation Organic Act. Hearings, 96th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1979. pp. 6–15.

The membership of the National Science Board (as of February 1981), along with members' major affiliations during Board service and terms of service, is presented in Table 20. The membership, affiliations, and terms of service of the 99 former members of the Board are presented in appendix Q. Table 20 and appendix R are summarized chronologically in appendix Q. The present and former Chairmen and Vice Chairmen of the Board are presented in table 20.

TABLE 20

NATIONAL SCIENCE BOARD

TERMS EXPIRE MAY 1982

DR. RAYMOND L. BISPLINGHOFF
VICE PRESIDENT FOR RESEARCH
AND DEVELOPMENT
TYCO LABORATORIES, INC.
EXETER, NEW HAMPSHIRE

#*DR. LLOYD M. COOKE
VICE CHAIRMAN, ECONOMICS
DEVELOPMENT COUNCIL OF
NEW YORK CITY, INC.
NEW YORK, NEW YORK

*MR. HERBERT D. DOAN
(VICE CHAIRMAN, NATIONAL
SCIENCE BOARD) CHAIRMAN
DOAN RESOURCES CORPORATION
MIDLAND, MICHIGAN

DR. JOHN R. HOGNESS
PRESIDENT
ASSOCIATION OF ACADEMIC
HEALTH CENTERS
WASHINGTON, D.C.

DR. WILLIAM F. HUEG, JR.
PROFESSOR OF AGRONOMY AND
DEPUTY VICE PRESIDENT
AND DEAN
INSTITUTE OF AGRICULTURE,
FORESTRY, AND HOME ECONOMICS
UNIVERSITY OF MINNESOTA
ST. PAUL, MINNESOTA

*DR. MARIAN E. KOSHLAND
PROFESSOR OF BACTERIOLOGY AND
IMMUNOLOGY
UNIVERSITY OF CALIFORNIA AT
BERKELEY
BERKELEY, CALIFORNIA

DR. JOSEPH M. PETTIT,
PRESIDENT
GEORGIA INSTITUTE OF
TECHNOLOGY
ATLANTA, GEORGIA

DR. ALEXANDER RICH
SEDGWICK PROFESSOR OF
BIOPHYSICS
DEPARTMENT OF BIOLOGY
MASSACHUSETTS INSTITUTE OF
TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS

#REAPPOINTED FOR SECOND TERM
*MEMBER, EXECUTIVE COMMITTEE

TERMS EXPIRE MAY 1984

*DR. LEWIS M. BRANSCOMB
(CHAIRMAN, NATIONAL SCIENCE BOARD)
VICE PRESIDENT AND CHIEF SCIENTIST
INTERNATIONAL BUSINESS MACHINES, INC.
ARMONK, NEW YORK

DR. EUGENE H. COTA-ROBLES
PROFESSOR OF BIOLOGY
BIOLOGY BOARD OF STUDIES
UNIVERSITY OF CALIFORNIA AT SANTA CRUZ
SANTA CRUZ, CALIFORNIA

DR. ERNESTINE FRIEDL
DEAN OF ARTS AND SCIENCES AND TRINITY COLLEGE, AND
PROFESSOR FO ANTHROPOLOGY
DUKE UNIVERSITY
DURHAM, NORTH CAROLINA

DR. MICHAEL KASHA
DISTINGUISHED PROFESSOR OF PHYSICAL CHEMISTRY
INSTITUTE OF MOLECULAR BIOPHYSICS
FLORIDA STATE UNIVERSITY
TALLAHASSEE, FLORIDA

*MEMBER, EXECUTIVE
#SERVED PARTIAL TERM; REAPPOINTED FOR FULL TERM.

DR. WALTER E. MASSEY
DIRECTOR
ARGONNE NATIONAL LABORATORY
ARGONNE, ILLINOIS

DR. DAVID V. RAGONE
PRESIDENT
CASE WESTERN RESERVE UNIVERSITY
CLEVELAND, OHIO

DR. EDWIN E. SALPETER
J.G. WHITE PROFESSOR OF PHYSICAL SCIENCES
CORNELL UNIVERSITY
ITHACA, NEW YORK

#DR. CHARLES P. SLICHTER
PROFESSOR OF PHYSICS AND IN THE CENTER FOR ADVANCE STUDY - UNIVERSITY OF
ILLINOIS AT URBANA-CHAMPAIGN
URBANA, ILLINOIS

Terms Expire May 1986

Dr. Peter T. Flawn
President
University of Texas at
Austin
Austin, Texas

Dr. Mary L. Good
Vice President and
Director of Research
UOP, Inc.
Des Plaines, Illinois

Dr. Peter D. Lax
Professor of Mathematics
Courant Institute
Mathematical Sciences
New York University
New York, New York

Dr. Homer A. Neal
Dean of Resarch and Graduate
Development, and Professor
of Physics
Indiana Universiyt
Bloomington, Indiana

Dr. Mary Jane Osborn
Professor and Head
Department of Microbiology
University of Connecticut
School of Medicine
Farmington, Connecticut

#Dr. Donald B. Rice, Jr.
President
The Rand Corporation
Santa Monica, California

Dr. Stuart A. Rice
Frank P. Hixon Distinguished
Service Professor of
Chemistry
The James Franck Institute
University of Chicago
Chicago, Illinois

(One Vacancy)

#Reappointed for second term.

TABLE 20

CHAIRMEN AND VICE CHAIRMEN

NATIONAL SCIENCE BOARD

Chairmen

	Terms	
	NSB Service	Chairman
James B. Conant†	1950-53	1950-51
Chester I. Barnard†	1950-56	1951-55
Detlev W. Bronk†	1950-64	1955-64
Eric A. Walker	1960-66	1964-66
Philip Handler	1962-74	1966-70
H. E. Carter	1964-76	1970-74
Norman Hackerman	1968-80	1974-80
Lewis M. Branscomb	1979-	1980-

Vice Chairmen

	Terms	
	NSB Service	Vice Chairman
Edwin B. Fred	1950-56	1950-53
Detlev W. Bronk†	1950-64	1953-55
Paul M. Gross	1950-62	1955-62
Lee A. DuBridge	1950-54 1958-64	 1962-64
Philip Handler	1962-74	1964-66
Ralph W. Tyler	1962-68	1966-68
E. R. Piore	1961-72	1968-70
Roger W. Heyns	1967-76	1970-74
Russell D. O'Neal	1972-78	1974-78
Grover E. Murray	1968-80	1978-80
Herbert D. Doan	1976-	1980-

†Deceased

B. VACANCIES

As is depicted in appendix R, there have been 16 major vacancies on the National Science Board lasting approximately one year each, with the exception of one vacancy which lasted approximately two years during the period 1976–1978. Five of these major vacancies followed the premature expiration of members' terms during the period 1958–68. Ten of these vacancies, however, were due to delays in the appointment of Board members for normal terms of service. Of the latter ten vacancies, eight occurred during the period 1978–1979, constituting an unprecedented delay in the appointment (including one reappointment) of an entire slate of eight Board members. One vacancy still existed as of February 1981, due to the appointment of Dr. John B. Slaughter as Director of NSF in 1980. Dr. Slaughter originally had been on the Board's list of nominees for Board membership, but he was removed by the White House when the decision was made to appoint him as NSF Director. As of February 1981, the NSB had not named a replacement nominee for Board membership.

The Board agreed in 1978 that members whose terms have expired should be invited to continue to serve as nonvoting consultants to the Board until their successors have been duly appointed and for a total of 12 months thereafter.[6] In addition, Board nominees, following submission of their names to the Senate for confirmation, are appointed as consultants to the Board and are invited to participate, without a votes, in Board activities.[7]

C. PREMATURE EXPIRATION OF TERMS

The terms of service of 16 of the 95 non-ex officio former Board members ended prematurely due to death or resignation during the period 1950 through 1976. Eleven of these premature expirations, however, occurred during the period 1950 through 1963. During the last decade, there has been only one such premature expiration.

D. REAPPOINTMENTS

There have been 38 cases in which a non-ex officio Board member has been reappointed to the Board during terms beginning during the years 1952 through 1980. (In addition, one Board member whose partial term expired subsequently was appointed Director of the National Science Foundation.) Thus, almost one-third of the 118 present and former non-ex officio members of the Board were or are reappointees.

Nineteen reappointments were made in the first decade of the Foundation's operations, ten in the second decade, eight in the third decade, and one in 1980. The relatively large number of reappointments during the first decade of the Foundation's operations was due largely to a desire for initial stability and continuity in the National Science Board. As pointed out in Chapter II of this study, the eight members who were originally appointed to the Board for two-year terms expiring in 1952 were all reappointed by President Truman for full six-year terms. Two of these eight members subsequently were reappointed for a second six-year term. Six of the other 16 non-ex officio members who finished the first two years of service on the Board were also reappointed upon the expiration of their initial terms. Subsequent to this initial period, reappointments to the Board have tended to decline in frequency. Only one reappointment has been made during each of the three NSB terms beginning in 1976 and 1980, respectively.

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[6] National Science Board. Approved Minutes of the 200th Meeting of the National Science Board, August 17–18, 1978; interview.

[7] National Science Board. Compendium of NSB Rules (NSB–78–450) November 1, 1978.

Of the 38 reappointments to the National Science Board, 18 were accepted by members who had previously served full six-year terms; the remainder were accepted by members who had only served out the remaining portions of terms which had ended prematurely. Of the 13 Board members who were appointed to serve out the remaining portions of terms which ended prematurely, only three were not subsequently reappointed to serve on the Board in a regular or ex officio capacity.

TABLE 21

GEOGRAPHIC REPRESENTATION OF NATIONAL SCIENCE BOARD MEMBERS
(by residence at time of appointment)

TWO-YEAR INTERVAL BEGINNING MAY 10

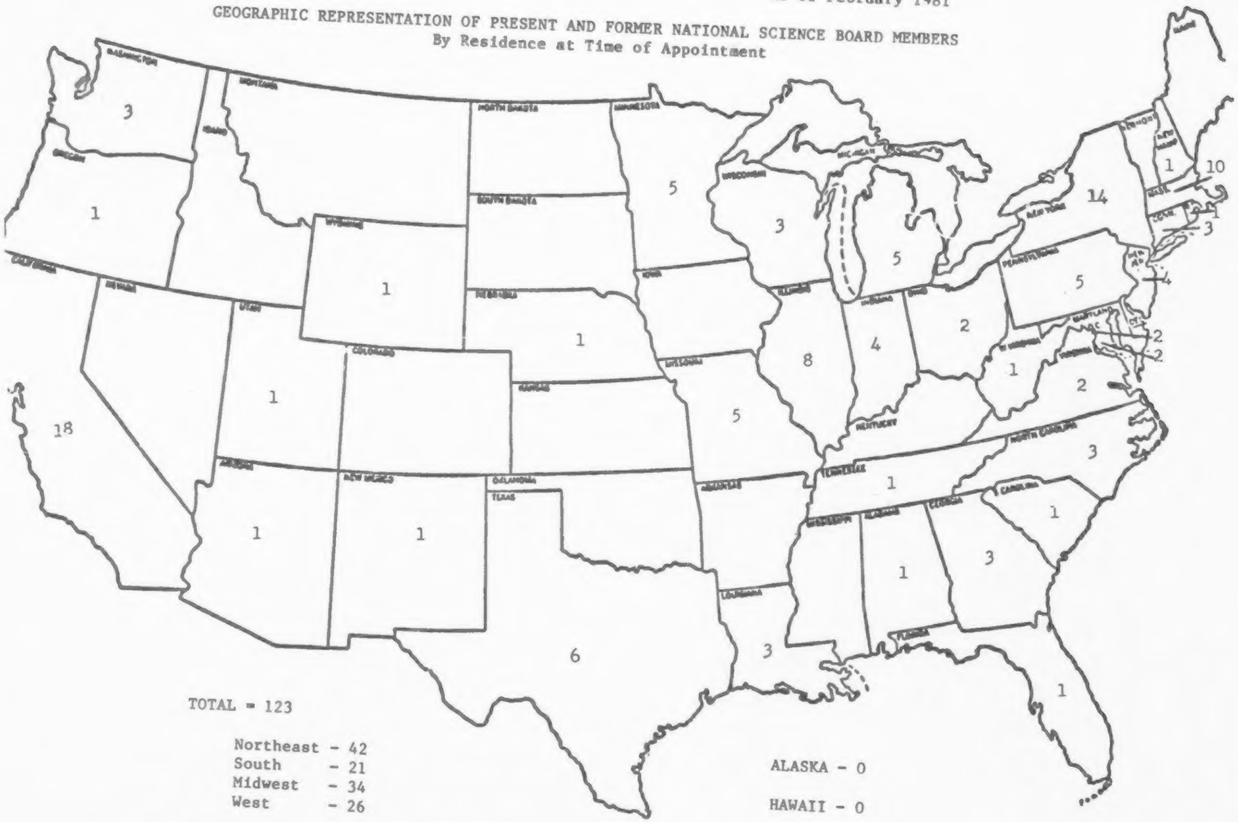
	1950-52	1952-54	1954-56	1956-58	1958-60	1960-62	1962-64	1964-66	1966-68
NE	10	10	8	8	6	8	12	14	11
S	4	4	4	5	6	6	7	6	7
MW	7	7	9	7	7	7	4	3	4
W	4	4	4	5	6	4	2	2	3

	1968-70	1970-72	1972-74	1974-76	1976-78	1978-80	1980-82	Total ave.	ave. 70-80
NE	9	9	10	9	7	8	7	9.1	8.2
S	5	5	4	4	4	5	5	5.1	4.4
MW	6	5	5	4	5	5	6	5.7	5.0
W	5	6	6	8	9	7	5	5.0	7.0

CHART 1

As of February 1981

GEOGRAPHIC REPRESENTATION OF PRESENT AND FORMER NATIONAL SCIENCE BOARD MEMBERS
By Residence at Time of Appointment


3
1
18
1
1
1
1
1
1
6
5
3
5
8
4
2
5
14
1
10
1
3
4
2
2
1
2
5
3
1
1
1
3
1
3
1

TOTAL = 123

Northeast - 42
South - 21
Midwest - 34
West - 26

ALASKA - 0

HAWAII - 0

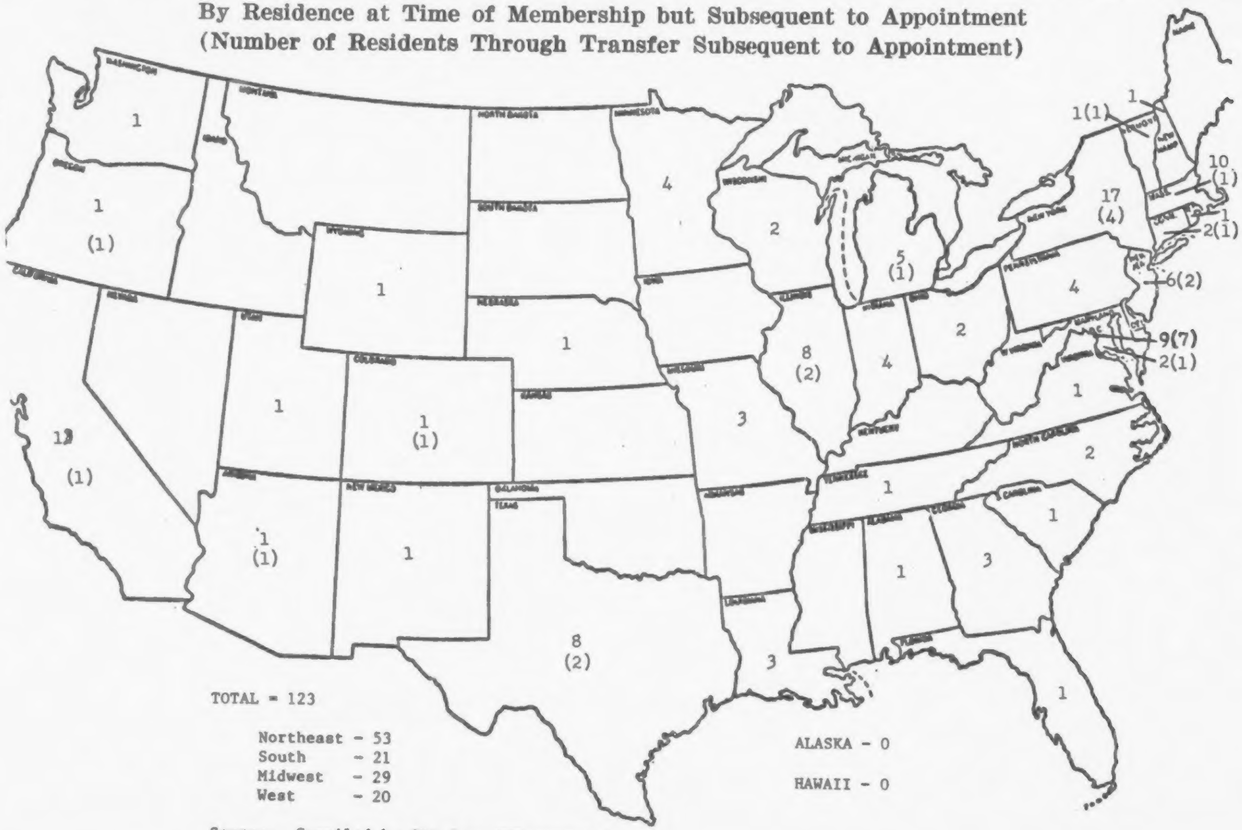
Source: Compiled by CRS from NSB materials.

CHART 2

As of February 1981

GEOGRAPHIC REPRESENTATION OF PRESENT AND FORMER NATIONAL SCIENCE BOARD MEMBERS

By Residence at Time of Membership but Subsequent to Appointment
(Number of Residents Through Transfer Subsequent to Appointment)


1
1
(1)
13
(1)
1
1
1
(1)
1
(1)
1
1
8
(2)
4
2
3
8
(2)
3
5
(1)
4
2
1
1
1
3
4
17
(4)
1
1(1)
10
(1)
1
2(1)
6(2)
9(7)
2(1)
1
2
1
1

TOTAL = 123

Northeast - 53
South - 21
Midwest - 29
West - 20

ALASKA - 0

HAWAII - 0

Source: Compiled by CRS from NSB materials.

TABLE 22

STATES NOT REPRESENTED BY PRESENT OR FORMER NATIONAL SCIENCE BOARD MEMBERS*

Alaska

Arkansas

Delaware

Hawaii

Idaho

Iowa

Kansas

Kentucky

Maine

Mississippi

Montana

Nevada

North Dakota

Oklahoma

South Dakota

TOTAL: 15

---

* Not represented either by appointment or by residence during tenure on Board.

TABLE 23

REPRESENTATION OF WOMEN AND MINORITIES ON THE NATIONAL SCIENCE BOARD

TWO-YEAR INTERVAL BEGINNING MAY 10

	1950-52	1952-54	1954-56	1956-58	1958-60	1960-62	1962-64	1964-66	1966-68
Wmn.	2	2	2	1-2	1	1	2	2	2
Min.	2	2	2	2	1	1	1	1	0-1

	1968-70	1970-72	1972-74	1974-76	1976-78	1978-80	1980-82	total ave.	ave. 70-80
Wmn.	2	0	1	2	3	3	4	1.9	2.6
Min.	0	1	1	2	2	3	5	1.7	2.6

E. GEOGRAPHIC DISTRIBUTION

Geographic representation among members of the National Science Board is mandated under section 4 of the National Science Foundation Act. The geographic representation of the 123 present and former Board members according to residence during tenure on the Board as of February 1981 is presented in appendix S and summarized in chart 2.[8] The geographic representation of Board members by residence at the time of first appointment is summarized in chart 1. Members of the Board represent 36 States by residence at the time of appointment or by residence during tenure; 29 states are represented by residence at the time of appointment only.[9] The geographic representation of Board members by residence at the time of appointment (corresponding to chart 1) is summarized chronologically and by major geographic sector in table 21.[10] The 15 States not represented by present or former Board members either by appointment or by residence during tenure are listed in table 22.

Of the four regions defined in table 20, the States of the Northeast generally have been overrepresented by Board members relative to the States of the South, Midwest, and West, although a fairly uniform geographic distribution has existed among Board members since 1976. Only once, during the period 1954 through 1956, did members from the Midwest predominate on the Board. Members from the West were predominant on the Board only once, during the period 1976 through 1978. At no time have members from the South ever been predominant on the Board. On average, the South has been least represented among Board members for NSB terms beginning in the years 1972 through 1980.

A comparison of charts 1 and 2 shows the extent of Board member migration subsequent to appointment to the NSB, particularly migration from the West and Midwest to the Northeast. The migration of newly appointed NSF directors into the Northeast—specifically, into the Washington, D.C. area—from other regions of the country accounts for less than 20 percent of this trend. (See footnote 10 below.)

F. REPRESENTATION OF MINORITIES AND WOMEN

As pointed out in chapter II of this study and in section A of this chapter, the representation of women and minority groups in the selection of nominees for membership on the National Science Board has been a consideration in the Board selection process since the first Board was selected in 1950. The 12 women who have served as Board members are listed in appendix T. The nine minority members who have served on the Board are listed in appendix U.

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[8] In Chart 2, residence is defined as State residence for more than 50% of a Board member's tenure on the Board.

[9] The District of Columbia is treated as a State in this discussion of the totals referred to.

[10] In Table 21 and accompanying text, *Northeast* refers to Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *South* refers to Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia; *Midwest* refers to Illinois Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; and *West* refers to Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Washington, and Wyoming.

The representation of women and minorities (that is, blacks, and one Hispanic) on the Board since 1950 is summarized in table 23. The periods of least combined representation of minorities and women on the Board were 1958 through 1962 and 1968 through 1974. During the period 1958 through 1974, representation of blacks on the Board averaged one. The greatest representation of minorities and women on the Board has occurred most recently with the NSB term beginning in May 1980. The Board now includes four women, four Blacks (including the NSF Director), and one Hispanic.

G. BACKGROUND OF BOARD MEMBERS

According to section 4 of the National Science Foundation Act, as amended, nominees for Board membership "shall be eminent in the fields of basic, medical, or social sciences, engineering, agriculture, education, research management, or public affairs". The Act further specifies that the selection of Board members shall be "solely on the basis of established records of distinguished service," but there is no requirement that those selected must be representative of the various fields enumerated in which nominees for Board membership must be eminent.

A summary of the background, experience, and major interests of present and former National Science Board members is presented in table 24. The academic disciplines of current Board members are listed in table 25.

From table 24 it is readily apparent that approximately two-thirds of the present and former Board members have had academic institutions as their primary affiliation. Industrial affiliations have been the second most prevalent association among Board members, represented by approximately one-fourth of the 24 current Board members.

TABLE 24

February 1981

BACKGROUND, EXPERIENCE, AND MAJOR INTERESTS OF PRESENT AND FORMER NATIONAL SCIENCE BOARD MEMBERS

	Present	Former	Totals
Primary Affiliations	(24)	(98)	(122)
University	16	63	79
College/Institute	0	10	10
Nonprofit/Private Foundation	3	8	11
Industry	4	12	16
Other	1	5	6
Academic Background			
Biological/Medical Sciences	6	27	33
Education	1	4	5
Engineering	5	6	11
Mathematical/Physical Sciences	10	47	57
Social Sciences	2	12	14
Other	0	3	3
Interest/Experience			
Academic/Administrative/Other			
Primary	6	47	53
Secondary	18	47	65
Education/Teaching/Research			
Primary	14	36	50
Secondary	4	43	47
Industry/Applied Research			
Primary	4	16	20
Secondary	2	9	11

TABLE 25.—*Disciplines of present National Science Board members*

Terms expire May 10, 1982:	
Bisplinghoff, Raymond L.	Engineering.
Cooke, Lloyd M.	Chemistry.
Doan, Herbert D.	Chemical engineering.
Hogness, John R.	Medicine.
Hueg, William F., Jr.	Agronomy.
Koshland, Marian E.	Bacteriology, immunology.
Pettit, Joseph M.	Engineering.
Rich, Alexander	Biophysical chemistry.
Terms expire May 10, 1984:	
Branscomb, Lewis M.	Physics.
Cota-Robles, Eugene H.	Biology.
Friedl, Ernestine	Anthropology.
Kasha, Michael	Chemistry.
Massey, Walter E.	Physics.
Ragone, David V.	Engineering.
Salpeter, Edwin E.	Astrophysics.
Slichter, Charles P.	Physics.
Terms expire May 10, 1986:	
Flawn, Peter T.	Geology.
Good, Mary L.	Chemistry.
Lax, Peter D.	Mathematics.
Neal, Homer A.	Physics.
Osborn, Mary Jane	Microbiology.
Rice, Donald B., Jr.	Economics and management.
Rice, Stuart A.	Chemistry.
1 vacancy	

The academic background of Board members has been concentrated most heavily in the mathematical and physical sciences throughout the history of the Foundation. Currently, 44 percent of the members of the Board have academic backgrounds in the mathematical and physical sciences. The biological and medical sciences constitute the second most represented major group of academic backgrounds among Board members, followed by the social sciences, engineering, and education. The experience and primary interests of current Board members have focused more on the areas of teaching, research, and, to a lesser extent, industry than have those of former Board members.

H. PARTICIPATION IN RELATED ORGANIZATIONS

Of the appointed members serving on the National Science Board between 1970 and 1980, approximately half served on from one to four other science-related Federal boards, councils, or advisory bodies during their tenure on the NSB. The average number of these organizations served on by the latter group has decreased from approximately two to one during the period 1970 through 1980. The most prevalent among organizations on which Board members served between 1970 and 1980 has been the National Academy of Sciences; others represented include groups advisory to the President, the National Institutes of Health, the Public Health Service, the Navy, the Department of Defense, and the Department of State. Many Board members also served on Federal boards, councils, or advisory bodies or were employed by the Federal Government prior to their appointment to the Board. In addition, most Board members have been members of several scientific, engineering, or educational professional organizations during their tenure on the Board. During the period

1970 through 1980, Board members generally were members of three to five such organizations.[11]

Some examples will demonstrate how broadly the network of "interlocking Federal directorates" involving Board members has extended. Dr. Detlev W. Bronk served on the National Science Board during the period 1950 through 1964, and was NSB Chairman from 1955 through 1964. During his tenure on the Board, Dr. Bronk's primary occupation was as president of the Rockefeller Institute for Medical Research. Also during this period, Dr. Bronk served as a member of the President's Science Advisory Committee to the National Aeronautics and Space Administration, the Atomic Energy Commission's Advisory Committee on Biology and Medicine, the National Advisory Health Council, the President's Commission on Civilian National Honors, the National Commission on the Development of Scientists and Engineers, the National Selective Service Science Advisory Group, and the Science Advisory Group of the Office of Defense Management. In 1950, Dr. Bronk also served as the president of the National Academy of Sciences. Outside of the Federal Government and NAS, Dr. Bronk once served as the president of the American Association for the Advancement of Science (1952) and was a member of more than 18 professional and scientific associations.

Dr. Philip Handler was an NSB member from 1962 to 1974, and was NSB Chairman from 1966 to 1970. During Dr. Handler's tenure on the Board, his primary occupation included serving as chairman of Duke University's Biochemistry Department, as a director of Squibb-Beechnut, Inc., and beginning in 1969, as president of the National Academy of Sciences. While on the NSB, Dr. Handler also served as chairman of the National Institutes of Health-Atomic Energy Commission Committee on Radiation and Aging; he also served as a member of the National Advisory Council on Research Facilities and Resources and of the President's Science Advisory Committee: he was chairman of the Survey of Life Sciences Section of the National Academy of Sciences, on the board of trustees of Rockefeller University, a member of the academic governing board of Hebrew University in Israel, and a member of the council of the Smithsonian Institution.

Dr. Saunders Mac Lane served on the Board from 1974 to 1980, during which time he was employed as a distinguished professor of mathematics at the University of Chicago. While on the Board, Dr. Mac Lane also served as vice president of the National Academy of Sciences, a position which included the chairmanship of the committee which approves NAS reports for publication.

These examples show that NSB members can have extensive contacts and relationships with various Federal agencies, commissions, boards, and other bodies in addition to their often numerous professional and private industry affiliations. Criticism has arisen regarding the extent of the network of Federal contacts among Board members, particularly to the effect that such contacts and affiliations might tend to lead to "inbred" or overly homogeneous Board positions on science policy issues. But the extent of Board member affiliations with other Federal bodies has been defended by Board members and others on a number of grounds.[12] One defense is that, because Board members are highly distinguished professionals, and because appointment to Federal panels, commissions, and the like is considered to be indicative of distinction, it is natural that many NSB members would tend to be appointees to other prestigious Federal advisory bodies. Other responses to criticism of extensive Federal ties among NSB members refer to advantages in effective Board operations to be gained through greater knowledge of Federal activities that such ties bring, and to the effectiveness of NSB rules for the identification and control of instances when members have conflicts of interest regarding matters considered by the Board.

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[11] Extracts from Who's Who in America, 1954–1981; and personal biographies obtained from the Executive Secretary, National Science Board.

I. MEMBERSHIP OF NSB COMMITTEES

The structure of the committees of the National Science Board has changed over the years, but several generalizations can be made about the membership of these committees.

There has been an Executive Committee of the Board since 1950, although this committee did not become statutorily required until 1968. The Board Chairman and Vice Chairman by custom are elected to membership on the Executive Committee.[13] Although the requirement for geographic representation among the elected and ex officio Executive Committee members was dropped in 1962, there has not been any lasting geographic concentration within this committee since that time. A woman was first elected to serve on the Executive Committee in 1977. Two minority representatives have served on the Executive Committee of the Board: Dr. L. M. Cooke and Dr. John B. Slaughter, who became NSF Director in December 1980.

With respect to the other committees of the Board, the NSB Chairman and Vice Chairman are ex officio members of all such committees.[14] The NSB Chairman assigns Board members to committees other than the Executive Committee, and also assigns the positions of Chairman and Vice Chairman within such committees.[15] The committee chairpersons are ex officio members of any subcommittees of the parent committees.[16] Executive Committee members often have been the chairman of the other standing and ad hoc committees of the Board. Within the last decade, two blacks and three women have served as chairpersons of standing committees of the Board. Drs. Cooke and Massey served as chairman of the Planning and Policy Committee; Drs. Harrison and Friedl chaired the Programs Committee, and Dr. Koshland chairs the Budget Committee.

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[12] Interviews with current and former NSB members and NSF staff.

[13] Compendium of NSB Rules (NSB-78-450).

[14] Ibid.

[15] Ibid.

[16] Ibid.

XII. NSB RELATIONSHIP TO ADVISORY COMMITTEES

A. Introduction

This chapter deals with NSF advisory committees, which are distinct from the NSB committees discussed at length in the preceding chapters. NSF's advisory committees, composed of leading, primarily academic researchers in specific scientific areas supported by NSF, are analogous, in the words of the NSB, "to 'visiting committees 'with the basic responsibility for critically reviewing the Foundation's efforts in its field." [1] They provide advice and recommendations to the Assistant Directors and division-level program managers regarding research in the disciplinary areas encompassed. Thus they play a far more important role than the National Science Board in developing program priorities for specific areas of science that NSF supports. For the major part of NSF's history, from 1950 until January 1978, the National Science Board played the critical role of nominating members of the advisory committees and receiving yearly reports (both oral and written) from the chairpersons of the advisory committees. But the NSB relationship to the advisory committees gradually has moderated. In January 1978, the Board relinquished to the Director responsibility for naming (and even approving the Director's selection of) advisory committee members so that today, advisory committees are named by and are wholly responsible to the NSF Director. In current practice, NSB members may choose to attend advisory committee meetings and report on important policy issues discussed; but the Board attendance rate has been very low.

B. Functions of the Advisory Committees

According to an internal NSF memorandum, the functions and structure of most advisory committees are similar, and can be represented by the following framework of the Advisory Committee for Astronomical, Atmospheric, Earth, and Ocean Sciences.[2] The responsibilities of each advisory committee are, in general:

> To review individual programs and overall program balance and furnish recommendations to [the Assistant Director].
>
> To establish a procedure that will provide carefully structured advice that each Division can use in developing and annually updating its long-range plans. This will require that the Committee create effective mechanisms to gather and assess information both from Government sources and the scientific

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[1] Excerpt from the Approved Minutes of the 101 Meeting of the National Science Board, Sept. 9-10, 1965. Subject: Advisory Committees: Dr. Haworth's Reorganization Plan.

[2] NSF Memorandum of February 14, 1978, entitled "Status Report on NSF Advisory Committees," by W. J. Snider, Assistant to the General Counsel.

> community in order to develop a balanced view of scientific needs and opportunities.
>
> To advise the [Assistant Director] on the manpower structure in the areas of interest to the Division and recommend mechanisms for forecasting future trends, periodicially updating the forecasts, and advising on the probable impact on the national research capability and scientific potential.
>
> To establish procedures for determining special needs of the research community, such as equipment needs, special facilities and information systems, and make appropriate recommendations to [the Assistant Director].
>
> To extend special advice, as requested, to the Director and Deputy Director of NSF. The Committee also may be requested to undertake special studies from time to time.
>
> To submit an annual summary of activities to [the Assistant Director]. The Division Director, with the approval of the [Assistant Director] will make the report available to the public under the provisions of the Federal Advisory Committee Act.[3]

The advisory committees usually consist of 12 members, who serve for terms of three years. Committees normally meet two times a year. Typically the advisory committees do not review proposals for award, but may serve as liaison to ad hoc panels established for such purposes.[4]

C. HISTORY OF THE RELATIONSHIP BETWEEN NSB AND THE ADVISORY COMMITTEES

Public Law 81-507, the NSF enabling legislation, specified the creation of Divisions organized along disciplinary lines and required each Division to create a committee which "shall make recommendations to, and advise and consult with, the Board and Director with respect to matters relating to the programs of its division." [5] In those early days, the NSB had the authority to appoint advisory committee (called divisional committee) members' and the advisory committee "rules of procedure were subject to restrictions imposed by the NSB." P.L. 81-507 did not require NSB members to be members of divisional committees. But, the NSB interacted closely with the divisional committees since it adopted a policy which required that at least two NSB members were to be members of each committee. NSB rules also required committees to report on specific programmatic matters, develop tentative budgets, and identify proposed new programs.

The NSB relationship to advisory committees was loosened somewhat starting in 1951 when the Board eliminated the requirement for NSB representation on divisional committees and charged each committee with the responsibility of advising and making recommendations to the Assistant Director in charge of the Division. Reorganization Plan No. 2 of 1962, which went into effect on June 8, 1962, eliminated the dual reporting functions of the committees by terminating the responsibility of the divisional committees to advise and consult with the Board. Thereafter the advisory committees became responsible to the Director.

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[3] NSF. Office of the Assistant Director for Astronomical, Atmospheric, Earth, and Ocean Sciences. AD/AAEO Circular No. 4. Subject: Advisory Committee Structure—AAEO, Dec. 1, 1976. 2 p.

[4] Ibid., p. 2.

[5] NSF. Memorandum to members of the National Science Board. Subject: NSF Advisory Committees. Mar. 18, 1974 (NSB 74-85), p. 1. The cited statute is Section 8 of P.L. 81-507.

By 1965, as NSF had grown from four to eight divisions, the Director reported that Committees were not necessarily required for separate divisions, and that he should be allowed to organize other advisory committees as necessary for particular functions. This goal was achieved with the adoption of Reorganization Plan No. 5 of 1965, which abolished the statutory requirement for divisional committees and allowed the Director to create an advisory committee structure of his own choosing.[6] Thereafter the Director reconstituted the original eight divisional committees into six advisory committees, one each for: Biological and Medical Sciences; Engineering; Mathematical and Physical Sciences; Social Sciences; Science Education; and Institutional Relations. (O/D 65-19, Sept. 24, 1965.) The specific charge for each was to:

> . . . critically review . . . the Foundation's efforts in its field, and provid[e] . . . advice and comment concerning proposed new plans for the Foundation as they affected its area of interest. Each committee was directed to report to the appropriate Associate Director, and to present an annual report to the Director. The Chairman and Vice-Chairman of each committee was to be invited to meet with the Board once a year to review their activities.[7]

As a result, typically the chairman of each advisory committee and of the Science Information Council (also created pursuant to statute) annually presented an oral report to the Board. Sometimes each annual report was printed in the minutes of the NSB meetings. In addition, beginning in 1969, the Board staff began to prepare and distribute to NSB members summaries of the recommendations of each of the annual reports, in order to facilitate the Board's consideration of the recommendations.[8]

NSB members still shared control with the Director over the appointment of members of the advisory committees since, in practice, the Director consulted with the Board before making such appointments. However, in September 1966, the Chairman of the Board "stated it would be more expeditious if those appointments could be taken up with the appropriate Board committee rather than the full Board, and the Board unanimously accepted that suggestion." [9]

Section 16 of P.L. 90-407, contained language to reaffirm the changes made in the 1962 and the 1966 divisional committee system. These changes subsequently were codified in NSF Circular 68, which stated that "The Director has the authority to establish advisory committees with broad areas of responsibility to advise and consult with the Foundation whenever appropriate." The Circular established nine advisory committees reporting directly to the Assistant Directors, to provide advice, counsel, and critical review of the major Foundation missions. The Director retained authority to appoint the committee members. However, the Circular stated that "in practice" the Director would consult with Board Committees, as appropriate, in making his selections.[10]

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[6] Ibid., p. 2.

[7] NSB 74-85, op. cit., p. 3.

[8] NSB. Memorandum to Members of the National Science Board. Subject: Recommendations of Annual Reports of Foundation Advisory Committees and Science Information Council. April 3, 1969. (NSB-69-83.)

[9] Board minutes 108: 5, from NSB 74-85, op. cit., p. 4.

In 1972 during the incumbency of Dr. McElroy, the recently established NSF Management Council and Executive Council, which he created in order to strengthen his management of NSF (see appendix P), completed a study which recommended major changes intended to streamline and enhance utilization of the NSF advisory committee system.[11] These changes involved abolishing each of the four advisory committees which had been established under the Research Directorates and creating, in their place, one combined Advisory Committee for Research authorized to create subcommittees which would encompass the terms of reference of each of the abolished committees. The ostensible objective of the reorganization was to permit NSB to enhance utilization of the committees and to streamline the committees' functions. However, several developments that occurred since 1972 raise doubts as to whether these objectives were achieved. Events subsequent to 1972, in fact, seem to have widened the distance between the Board and the advisory committees.

The Board's erosion of power to appoint the members of the advisory committees seems to have begun around the time when responsibility for naming advisory committee members was removed from the full Board and given to the Board committees. The Programs Committee of the Board retained some control over coordinating the nomination function, but in January 1978 the Board reported that since the Foundation's policy for seeking Board nominations was inconsistent, henceforth the Board would cease making formal recomendations for membership of advisory committees:

> Dr. Shields * * * reported that the Programs Committee had reviewed the proposed appointments to the Advisory Committee for Science Education and the Advisory Committee for Minority Programs in Science Education * * *. In this discussion it was observed that the Foundation did not follow a consistent policy in the selection of advisory committee members. In some cases the Board is consulted; in others, the Board's views are not sought.
>
> The Committee decided not to make a formal recommendation to the Board with respect to these advisory committees.
>
> The Board Chairman noted that all these committees are advisory to the Director and that the nominations are forwarded to the Board for information.[12]

On several occasions the Board has expressed policies regarding the composition of membership of the advisory committees. However, NSB guidance regarding membership seems to have shifted. For instance, in 1970 the Board reported that "* * * an effort be made to lower the average age group, to include more women and people from industry and to consider geographic distribution." [13] Eight years later, in 1978, the Board minutes note that the Programs Committee " * * * proposed that future committees include a larger representation of science-oriented individuals. The Director agreed that the staff would take this recommendation into account in making future appointments." [14] The Board typically has viewed the criteria of geographic distribution and equitable representation of other factors—either for its own membership or in the award of NSF funds—as secondary to excellence in science. (See chapter VI on the Planning and Policy Committee.) Thus the criteria enunciated in 1978 may have differed from the intent of the criteria enunciated in 1970.

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[10] According to a NSF Circular, "those responsibilities remained essentially unchanged" in several subsequent circulars. As for example in Circular 109, July 31, 1972, which supplemented the policies of Circular 68.

[11] NSB 74-85, op. cit., p. 5, referring to a report by the Office of the Director, O/D 72-79.

[12] Minutes of Closed Session of NSB Meeting 195, p. CS: 195:7.

In May 1970, the Board proposed that the presentation of advisory committee annual reports be staggered throughout the year, rather than being concentrated in January and March, to permit the Board to give them greater attention.[15] A few years later, several members concluded that the advisory committees probably would never be essential to NSB, since they were advisory to the NSF Director (as contrasted with the former divisional committees which were required to report directly to the NSB).[16] The practice whereby NSB staff prepared summaries of the major recommendations contained in the annual reports of the advisory committees was limited, beginning in 1973, when only highlights of these annual reports, rather than the full reports, began to be presented to the Board.[17] In 1978, the NSB Chairman discontinued the practice of inviting advisory committee chairmen to report annually to the NSB on the activities of the committees under their jurisdiction on the grounds of ". . . an ever increasing level of Board activities and the consequent lack of time available for the reports. . . ." [18]

D. Low Rates of NSB Attendance at Advisory Committee Meetings

In addition to receiving the reports of the advisory committees, NSB members have been assigned continuously to attend advisory committee meetings. One measure of the relationship between the Board and the advisory committees consists of the rate of attendance at meetings of advisory committees and their subcommittees. In a 1978 memorandum, NSF reported that the Foundation had 26 advisory groups, with 583 members, and 50 additional subcommittees (with membership expected to total 700). The NSF fiscal year 1979 annual report listed as advisory groups with potential for NSB interaction, some 25 advisory committees or groups, one advisory council, and 47 subcommittees. During the fiscal year 1979,

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[13] ES: 133: 6.

[14] ES: 195: 7.

[15] ES: 131: 8.

[16] ES: 144: 13.

[17] See for instance, meeting 162.

[18] NSB. Memorandum to the File. Subject: Annual Presentations of NSF Advisory Committee Chairmen to the National Science Board. Apr. 16, 1979.

NSB members attended meetings of only 8 of these 73 bodies, and four other NSF sponsored meetings. (See Table 26).

TABLE 26.—NSB ATTENDANCE AT ADVISORY COMMITTEE AND SELECTED OTHER MEETINGS, FISCAL YEAR 1979

Name of meeting	Number of committee meetings [1]	Number of NSB members attending the meeting(s)
Advisory Council	2	2
Advisory Committee for Applied Science and Research Applications Policy	1	2
Advisory Committee for Science Education	2	2
Advisory Committee for Information Science and Technology	2	[2] 1
Advisory Committee for International Programs	1	1
Advisory Committee for Science and Society	2	4
Policy Research and Analysis and Science Resources Studies Subcommittee	1	1
Advisory Committee on Millimeter Wave Facilities of Advisory Committee for Astronomy	1	1
Engineering and Applied Science Small Business Conference on R. & D	2	3
Curriculum Exchange Conference	1	1
National Center for Atmospheric Research annual report	1	1
Annual presentation on joint oceanographic institutions and deep sea drilling	1	2

[1] Number of committee meetings an NSB member attended during fiscal year 1979.

[2] Consultant.

Source: Compiled from NSB materials.

Appendix V identifies, insofar as reported at the Board meetings, the interactions between the Board and advisory committees since mid-1975. It mirrors the limited pattern of interactions evidenced in 1979.

In June 1972 OMB issued Executive Order 11671, "Committee Management", which opened up all meetings of Federal advisory bodies. According to an NSB memorandum, "This has resulted in a minimal attendance by the public at Foundation advisory committee meetings. [But] the effect of this Order has changed the nature of the meetings rather considerably." The memorandum noted that NSB attendance at advisory committee meetings had been taken in the past. Some advisory committee members 'resentment was apparent since "* * * some groups * * * felt Board participation inhibited free discussion between the Committee and Foundation staff." As a result, perhaps, "* * * reports of policy items considered at committee meetings have of late rarely been presented," and the Board seldom took action on the recommendations presented by the advisory committees.[19]

The fact that the Board's attendance at advisory committee meetings does not seem to have been one of its major perceived functions was noted in the memorandum:

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[19] Memorandum regarding: Board Liaison with Advisory Committees to Chairman National Science Board from Executive Secretary, Feb. 12, 1973.

> The Board has always agreed, even during the divisional committee period, that it was desirable to have Board interaction with the major advisory committees, but there has never been a successful, sustained effort to do so. This has been due in part to the following factors: 1. work load of Board members, 2. lack of interest of Board members, 3. differing nature of the advisory committees, with a wide range of effectiveness, and 4. lack of timely notification of meetings to the Board.[20]

E. CURRENT NSB POLICY REGARDING ADVISORY COMMITTEES

The current NSB policy regarding advisory committee meetings requires Board members who have attended advisory committee meetings to make a written report to the Chairman and short oral presentations to the full Board regarding important items. The policy also requires advisory committees to notify the NSB of forthcoming meetings so that NSB members might volunteer to attend them. Typically one or two members have chosen to attend one or two meetings and subsequently present short reports to the full Board.

As noted above, one of the most important functions of advisory committees is to assist the NSF program manager or division director by helping set priorities for programs and designing those programs. An abstract of an 18-page report on the May 18, 1979 meeting of the Advisory Committee for the Division of International Programs, prepared by Dr. Dorothy Zinberg, chairman of the committee, indicates the breadth and importance of issues typically discussed:

> The topic of the open meeting was the role of NSF in international science from the perspectives of those involved in budgeting and policymaking. Representatives from the Department of State, the Office of Management and Budget, the National Science Board and the NSF Director discussed important objectives for international science activities. The Advisory Committee questioned all invited speakers on their views and relation to [the Division]. The Committee will utilize this background information in its first annual report to the Director recommending priorities and objectives [for the Division]. The Directorate will use the Advisory Committee's views as input from the U.S. scientific community for guidance on international programs.[21]

The Advisory Committee discussed: the relation of NSF international science programs to the Department of State, an OMB review of international science issues, an overview of policy for NSF international science programs, criteria for NSF programs with less developed countries, National Academy of Sciences programs, and a three-year budget analysis.

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[20] Idem.

[21] Abstract [of Advisory Committee Meeting]. Division of International Programs, May 18, 1979.

Despite the details discussed in most advisory committee meeting, most of the NSB reports to the full Board, at least as indicated in the open and closed session minutes, are descriptive and do not seem to contain any notable policy dilemmas or actions requiring NSB approval. For instance:

> Dr. Pettit reported that the Advisory Committee for Policy Research and Analysis * * * and Science Resources Studies * * * was engaged in oversight of the granting of awards * * *. He found the process very educational.[22]

Similarly:

> Dr. Salpeter reported that the Subcommittee [on Millimeter-wave Facilities of the Advisory committee for Astronomy] was considering two possible changes relative to the proposed 25-millimeter telescope. One had to do with design, i.e., using an unorthodox design rather than a parabolic dish. The other consideration was a different location rather than the one originally chosen on Mauna Kea * * * As a result of its discussions, the Subcommittee agreed to abide with the original plan * * *.[23]

Another function served by advisory committee meetings is the opportunity given to NSF staff to interact at the program-formulation stage with expert outside advisors (a possibility which is not present in Board deliberations, since Board program reviews are ex post facto, and program approval functions of the Board and Programs Committee are generally done after the staff has firmed up a program, when possibility for change is small). None of the Board procedures permit the kind of interaction with program-level officials afforded by the advisory committee procedures. For instance in attendance at the meeting of the advisory committee for the Division of International Programs, mentioned above, were eight advisory committee members, 36 NSF staff members, one NSB member (the chairman of the PPC Subcommittee on International Science), an OMB official, the Assistant Secretary of State for Oceans and International Scientific and Environmental Affairs, and one outside observer.

During late 1980 a Board member, Dr. Massey, chairman of the PPC, met with the NSF advisory committee chairmen to discuss the proposed reorganization of NSF. He reported that they also discussed the role of NSF advisory committees, especially how they should interact with the Board and the Board's responsibility for long-range planning. Dr. Massey stated that the advisory committee chairmen expressed a need for improved communications with the Board. It also was noted that the Acting Director would consider designing mechanisms to improve this situation. The participants also discussed coordination among NSF advisory committees and stated that advisory committee meetings in which there was Board representation were valuable.

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[22] 206: 17.

[23] 209: 13.

Several factors seem to compel a reassessment of the relationship between the Board and advisory committees, with a view toward improving communications between these groups. One is the advisory committee chairmen's expressed needs to meet with the Board more; another is the benefit that would accrue to the Board's budget decisions by closer Board attention to the priority-setting, planning, and budget-related exercises of the advisory committees. Closer interaction with the advisory committees also would open up the Board's perspective to a wider representation from the scientific communities not represented on the Board, but represented on the advisory committees. On the other hand, such cooperation might cause two problems. One is the potential of even greater Board involvement in NSF priority-setting and "micromanagement" activities, for which it already has been criticized. Another is the potential that the advisory committees 'value to the Director would be jeopardized because advisory committee discussions might not be as candid as they would be in the absence of outside observers.

XIII. RELATIONSHIP OF THE NATIONAL SCIENCE BOARD TO THE NSF ADVISORY COUNCIL

A. INTRODUCTION

In addition to the disciplinary advisory committees which serve primarily to advise NSF program managers regarding research opportunities and needs, the National Science Foundation has, from time to time, established other kinds of advisory groups to serve a variety of purposes—including representation of constituency groups—and in some respects to complement the functions of the National Science Board. Relevant for this inquiry are questions of redundancy and the possible need for more cross-fertilization between the Advisory Council and the National Science Board.

B. ORIGIN OF THE ADVISORY COUNCIL

1. Advisory Committee for Research

In 1972 the National Science Foundation established the Advisory Committee for Research on an experimental basis to provide advice and counsel to the Director on "research activities and potential in the United States," and "to provide input on problems related to the administration of research support."[1] The Committee had been created to replace the five separate divisional advisory committees that had been established previously to advise the Director basically on the "problems related to the administration of research."

The Committee was created to provide advice on issues of management and "sociology of science,"[2] issues mid-way between the specific research interests of disciplinary advisory committees and the broad policy concerns of the National Science Board. The Advisory Committee for Research conducted its work by means of task groups, which prepared reports on the following topics:[2]

1. Faculty Summer Salaries (Majority and Minority Reports)—October 1973.
2. Evaluation of the Peer Review System—October 1973.
3. (a) Cooperative Programs with Industry—October 1973.
   (b) Research Initiation—October 1973.
4. Long Range Planning—Equipment—October 1974.
5. Impact of NSF Research Support Programs—How Can It Be Measured?—April 1974.
6. Post Grant Evaluation—April 1974.

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[1] All information regarding the Advisory Committee for Research is adapted from a self-evaluation the group made shortly before the Director replaced the Committee. The report is: National Science Foundation. Advisory Committee for Research. Task Group No. 11 Report. Review and Evaluation of ACR Committee Operation. Oct. 23, 1975, typescript, nonpaginated, and from "Advisory Committee for Research," presentation by NSF staff member Creutz, Chairman of the Advisory Committee for Research to the National Science Board, April 1977.

[2] 189:27, May 13, 1977.

7. Criteria for Allocation of NSF Resources Between Individual Research Projects and Major Research Facilities in Certain Fields—October 1974.

8. Coupling University and Industrial Research (Fostering Interaction Among Research Organizations)—October 1974.

9. Evaluation and Support of Multidisciplinary Proposals—October 1974.

10. The Social Sciences as a Research Area in the National Interest—November 1975.

11. Review and Evaluation of Committee Operation—November 1975.

12. Evaluation of a Post Grant Evaluation Experiment—September 1976.

13. (a) Larger but Fewer Research Grants—November 1975.

(b) Research Equipment—November 1975.

14. (a) Grant Policy Manual—April 1977.

(b) Equipment Accountability—April 1977.

15. Support for Research Activity by Undergraduate Teaching Faculty—April 1977.

16. Faculty Salaries—April 1977.

17. Formula Grants—April 1977.

In October 1975 the Committee undertook a self-evaluation, apparently to meet its members' concerns that: it did not have the resources to do its work; it did not meet long enough to fulfill objectives; its work had little impact on the staff, Director, or Board; other advisory groups had more power; and the Advisory Committee's purpose was unclear. The Chairman of the Advisory Committee for Research enunciated some of these concerns in a presentation to the Board. He indicated that the Committee's impact was subtle, its tasks should be narrowly focused, and its activity would be a waste unless decisionmakers sought its advice:

> The special task group which evaluated the Committee's operation reminded the Foundation that advisers are busy people who are willing to assist the Foundation only if their advice is seriously considered when offered. Both the Foundation and the advisers benefit from thoughtful use of their time, but the tasks chosen must be tailored to the limited time that can be devoted to them. Studies of broad or global issues tend to be frustrating and unfruitful, while the most successful contribution to the Foundation and its advisory committees is that which is sufficiently narrow in focus to enable the committee to come to grips with the issues in the limited time available.[3]

The October 1975 report recommended five steps to improve the Committee's functioning.

2. *Legislative Language Encouraging Formation of an Advisory Council with Public Members*

Shortly thereafter the Deputy Director of NSF reported to the NSB that the Advisory Committee for Research would be replaced by a new NSF Advisory Council.[4] The NSF staff appears to have formulated plans for the Advisory Council as a response to a pending legislative proposal, introduced by Senatory Kennedy, Chairman of the Senate Subcommittee which reported out NSF's authorization legislation. Senator Kennedy had been interested in widening the membership of the National Science Board to include more women, minorities, and public members, which the NSB generally opposed. The Advisory Council, which is required to have public members, has been described as a compromise between the two positions to avoid sacrificing quality.[5] As a result, the creation of the Advisory Council seems to have been a direct response to the language of the fiscal year 1976 Senate authorization report which directed NSF to prepare a comprehensive report to "facilitate the participation of members of the public in the formulation, development and conduct of the Foundation's programs, policies, and priorities." The report added that the NSF should make these changes by means of administrative action or, if not, legislation would be introduced to meet the congressional committee's goals.[6]

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[3] 189: 6.

The Senate report instructed NSF to "ensure that the Council fulfills its purpose and that it does not duplicate the policy and advisory responsibility of the National Science Board," the Council should be composed of 24 members, and must include at least six individuals who are not scientists. The report required " * * * that the Council must furnish advice to the Board and the Director on broad policy matters relating to the activities of the Foundation, particularly science research and education policy, and that it must promote public understanding and access to information concerning the activities of the Foundation." [7] A current NSF brochure describes the Council's functions as "to operate at the agency level in order to provide a perspective from outside the Foundation on issues that transcend matters of concern to an individual discipline or program area, and that relate to the Foundation's interaction with the scientific community, with the Congress, and with the public." [8]

3. Membership of the Advisory Council

When he announced to the Board that he would create this Council, the Director stated that he would seek Board guidance, especially from the Programs Committee, in regard to membership.[9] But, according to the charter of the Advisory Council, the Director names the Council, and members are responsible only to him. Dr. Donald N. Langenberg, who would become NSF Deputy Director in 1980, was named its first chairman. Originally, appointments were for three-year terms with eight members rotating off the Council each year. Later, appointments were for one year with members customarily being reappointed for two additional one-year terms. Among former Council members is Emilio Q. Daddario, former Chairman of the House Subcommittee on Science, Research, and Development, which reported the 1968 legislation which expanded NSF's functions and, later, first Director of the congressional Office of Technology Assessment.

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[4] ES: 180:9.

[5] Interview.

[6] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Authorization Act, 1976. Senate. Report No. 94-111. May 9, 1975. 94th Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1976, p. 23.

[7] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Authorization Act 1977. Senate. 94th Congress, 2d Sess. Report 94-888. May 14, 1976. Washington, U.S. Govt. Print. Off., 1976. 39 p.

[8] The National Science Foundation Advisory Council. Nov. 1979. p. 2. (NSF-79-50.)

[9] ES: 182: 3.

4. Functions of the Advisory Council

The full Council generally meets twice annually, in the fall for the assignment of tasks and in the spring to report. The Director selects a steering committee to assist the chairperson and Foundation support staff in planning Council activity and related matters not requiring the formation of a separate task group.[10] The steering committee and the task groups meet in plenary session twice a year, and an additional one to three times per year for working sessions. The Director must approve the meeting agendas and task group assignments in advance.

In the manner of the Board, the Council has divided itself into task groups to study and prepare reports on important issues cutting across the fields of science and the Foundation's responsibilities. The Council creates four task groups each year. They function to prepare a report for the Director. The Director customarily sends the report to the Board for consideration. The topics studied thus far are:

1. Continuing viability of universities as centers for basic research;
2. Interaction between NSF and the public (done partially in response to the fiscal year 1976 Authorization Act requiring the NSF to establish a multifacted Science For Citizens Program);
3. Implications of business participation in NSF support of basic research;
4. Expanded scientific cooperation with Western Europe;
5. Equipment needs and utilization;
6. NSF resource allocation process among fields of science;
7. Accountability in research;
8. Alternative support mechanisms for academic research;
9. Multinational projects;
10. Funding "Blue Sky" proposals;
11. Research opportunities in alternate academic institutions; and
12. How to make scientific expertise available to groups responsible for setting public policy.

In November 1980 Dr. Langenberg, the Acting Director, and Dr. Slaughter, the Director-designate, selected new tasks from among those recommended by the Council's steering committee.[11] The new tasks were: "NSF and technology transfer; continuing education for engineers and computer professionals in universities and/

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[10] National Science Foundation. Charter of the National Science Foundation Advisory Council. Amended, Jan. 17, 1977, non-paginated.

[11] 220: 10.

or industry; the role of NSF in science education of the general public; and the role of rotators in the NSF." [12]

C. Relationship Between the Board and the Advisory Council

The only formal link between the Board and the Council is the requirement in the charter of the NSF Advisory Council which specifies that "the Director will appoint members to the Council in consultation with the National Science Board," a consultative process that generally involves pro forma NSB Programs Committee approval of the Director's proposed nominees.[13] Board minutes indicate, however, that a few Board members generally attend each Advisory Council meeting and that they or the Director later make short reports to the Board about the Advisory Council meeting or reports. For instance, Drs. Friedl, Hackerman, and Murray attended part of the May 1980 Advisory Council meeting. The Board was told that:

> Dr. Friedl reported that the Council's major activity was to discuss the interim reports of its four task forces. Dr. Hackerman met with the Advisory Council to express his views on present and future issues confronting the Foundation.[14]

From time to time, the Board has referred to the Advisory Council's reports, but there is no indication that these have been critical to the Board's work. For instance, during an NSB Executive Committee meeting in 1977, it was reported that the Deputy Director "suggested that the Chairman of Task Group No. 3 (concerned with the implications of business participation in NSF support of basic research) should coordinate the work of his Group with that of the NSB Ad Hoc Committee on the Support of Basic Researh in Industry." [15]

It is difficult to determine whether or not these reports have had an effect on the Board's deliberations. As NSB member Dr. Eugene Cota-Robles pointed out in his report to NSB Chairman Branscomb on the November 1980 Advisory Council meeting when discussing the new topics that task groups would work on, "The new task groups were in general given assignments on problems that frequently come to the Board." [16] One recent instance of similarity in assignments, for instance, is between the issues studied by the NSB Committee on the Role of Basic Research of the PPC and the Advisory Council Task Group No. 11, on "Research Opportunities in Alternate Academic Institutions". In his report to the Chairman, Dr. Cota-Robles also remarked that "* * * the discussions [of the task forces] forced me to reexamine and reconsider my positions on [the four topics of the task forces] vis-a-vis NSF and NSB policy." [17] Duplication of effort between the two groups may not be an issue, but the question can be raised about whether or not policymaking for

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[12] Letter from NSB member Dr. Eugene H. Cota-Robles, University of California at Santa Cruz to Dr. Lewis M. Branscomb, Chairman of the NSB, Nov. 12, 1980.

[13] 194: 4.

[14] 216: 15.

[15] EC: 77-10: 3.

[16] Letter, Cota-Robles to Branscomb, op. cit.

[17] Letter, op. cit.

NSF would be enhanced if more NSB members participated in the deliberations of the Advisory Council. Another question is whether the National Science Board is making sufficient use of the opportunities provided by Advisory Council deliberations and reports.

XIV. THE COMMITTEE ON AUDIT AND OVERSIGHT

A. Introduction

The NSB exercises oversight authority by means of several mechanisms already discussed.[1] The Board's oversight authority is exercised also through the Committee on Audit and Oversight, whose major functions are to ensure that the Action Review Boards in each directorate use appropriate review procedures and to assist in developing and in overseeing the quality and effectiveness of NSF pre-award selection processes and post-award evaluation procedures. The committee is a successor to two previous committees which had similar functions, the Ad Hoc Committee on Action Review Boards and the Ad Hoc Committee on Audit and Oversight.

The Committee is small, consisting of four members on the average. It meets for a short time, about 1 to 1.5 hours per meeting. Staff members of NSF provide the Committee members with considerable background materials to aid them in conducting their work, such as data on award approval processes, information on the work of the Action Review Boards (ARB) successive drafts of procedures governing Action Review Boards in the various directorates, staff reports dealing with oversight and evaluation, and secondary materials, such as journal articles dealing with evaluation of research and development.

The work of the committee typifies the process followed by an NSB committee, the necessary reliance on NSF staff support, and the actual effectiveness of a committee oriented to improving NSF administrative practices. In actuality, the NSF staff designs and implements changes in procedures and practice. However, the Board has acted to force staff to design new procedures when the Board has perceived problems, and then to ensure quality and consistency in the procedures developed by the staff.

B. A Predecessor Committee on Action Review Boards

The first predecessor committee, the Committee on Action Review Boards, was authorized by a resolution of the NSB, adopted on February 20, 1976, to oversee the Action Review Boards which the Director had created in each directorate in the aftermath of the uproar surrounding improper administration of the NSF's review and award procedures in the Science Education Directorate following the MACOS situation.[2] Normally Assistant Directors are delegated authority to approve all awards which do not require NSB approval. The Review Boards were entrusted with seeing that awards were reviewed properly, that the pros and cons of an award were expressed in the peer review process, and that all awards needing NSB approval were properly transmitted to the Board.[3]

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[1] See Chapter V on the Programs Committee and Chapter XII on the Relationship to Advisory Committees.

[2] Statement of Dr. H. Guyford Stever in U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. 1977 National Science Foundation Authorization. Hearings. 94th Congress, 2nd session, Washington, U.S. Govt. Print. Off., 1976, p. 568. (See chapter XVII on science education.)

At the same time that he created the Action Review Boards, the Director created a Director's Action Review Board (DARB) to review and make recommendations regarding approvals and declinations recommended by program managers for awards requiring NSB approval, before those awards are sent to the Board. The permanent members of the DARB are the Deputy Director (chairman), the General Counsel, the Assistant Director for Administration, and the Special Assistant to the Director.[4]

Among the Action Review Board Committee's first activities was receiving reports from two Assistant Directors regarding their operations and Action Review Board procedures. The committee also considered whether individual members should attend a few meetings of the Action Review Boards, and whether it would be feasible to hear from all six directorates at each Board meeting.[5] Subsequently the Committee reported that it "found it impractical and unnecessary to meet with the Assistant Directors at each regular meeting."[6] The Board revised the Committee's charter, limiting it to:

> * * * hold an initial comprehensive meeting with the Assistant Director in each granting directorate, attend as observers representative Action Review Board meetings, stand ready to hear reports of progress and problems at each regular meeting of the Board, and call for such additional data as may be required.[7]

The Board also instructed the committee to "* * * report to the Board its judgment as to the effectiveness of the Action Review Boards * * *."

In order to carry out its mandate, the ad hoc committee convened oversight meetings with three Action Review Boards and, then, in October 1976 it endorsed recommendations that staff had prepared to standardize and streamline procedures, disbanded the committee, and proposed that a new ad hoc committee be convened in a year to review the functioning of ARBs. The recommendations adopted by the Ad Hoc Committee on Action Review Boards were as follows:

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[3] NSF Circular No. 76, which deals with the review and approval of NSF awards summarized the membership and functions of the Action Review Boards as follows:

"Action Review Board. Each Directorate's Action Review Board is chaired by the Assistant Director or Deputy Assistant Director and includes program staff and representatives from the Office of Government and Public Programs, and the Division of Grants and Contracts.

"ARB review generally focuses on conformance to established NSF policies, objectives, and procedures. Proposals, awards, or declinations are examined for: (1) Completeness of documentation; (2) Appropriate processing; (3) Conflicts of interest; (4) Appropriateness of titles and summaries; (5) Thoroughness of panel and/or ad hoc review; (6) Adequacy of program officer's rationale; (7) Reconciliation of divergent reviews; (8) Instances where the proposal has been so substantially revised as a result of the initial review process as to merit further external review; (9) Institutional arrangements; (10) Unusual financial arrangements; and (11) Other appropriate administrative, logistic, or managerial problems."

(NSF Circular No. 76, Revision No. 4, Grants and Contracts. Subject: Review and Approval of NSF Awards. Oct. 1, 1977, pp. 1–2.)

[4] NSF Circular No. 76, op. cit., pp. 2–3, and Staff Memorandum, Organization, Subject: Director's Action Review Board, Feb. 27, 1976. (O/D 76–13.)

[5] ES: 180: 15.

[6] Memorandum from Dr. Campbell, Chairman, Ad Hoc Committee on Action Review Boards, to Dr. Norman Hackerman, Chairman, National Science Board, on "Recommendations of the Ad Hoc Committee on Action Review Boards," Sept. 1976.

[7] Idem.

1. Each Directorate should issue definitive guidelines which precisely describe the functions, the procedures, and the authority of the Action Review Board (ARB) insofar as that Directorate is concerned.

2. Recognizing that Directorates have special needs and procedures, each Directorate should summarize the following proposed ARB practices and submit them to the Director of NSF for his specific approval.

(a) What actions are required to be reviewed;

(b) At what levels of funding;

(c) Guidance regarding situations where peer review is not required or may be inappropriate;

(d) Description of the review to be afforded block grants vis-à-vis the review of individual awards;

(e) Delineation of any situations where representatives of the Division of Grants and Contracts or the Office of General Counsel do not review recommended awards.

3. Each Directorate should keep records listing awards reviewed at each ARB meeting, with notations of significant problems encountered so that individual actions can be identified for clarification to both program and administrative staff.

4. Representatives of the Division of Grants and Contracts and the Office of Government and Public Programs should rotate assignments to ARB's on a schedule that would permit them to become familiar with the individual program activities but would still allow them to maintain the ability to review matters in an objective manner. The General Counsel should consider the assignment of his representatives to achieve similar goals.

5. The Director should continue to emphasize to the full staff that the Grants and Contracts Officer has the responsibility for assuring that any award recommended is in the best interest of the agency and, if such an award is made, that it is consistent with applicable policy, regulations, directives, circulars, and fund certifications. In view of the Grants and Contracts Officer's ultimate responsibility for all awards, he may decline to make such awards as he deems inappropriate after discussing the proposed actions with the appropriate Assistant Director or his designee. If questions of appropriateness remain, the Director of the Division of Grants and Contracts may refer the matter to the Director's Action Review Board for advice and comment.

6. It is important for senior management personnel of NSF to continue to lead and encourage the full and complete cooperation of all the individuals involved in the functioning of Action Review Boards, given their vital mission in NSF.

7. Directorates are encouraged to simplify and reduce the amount of documentation that is required by the ARB's. Procedures which would minimize the impact on the workload, such as the random sampling of recommended awards and declinations, should be experimentally employed with the approval of the Director.

8. An important function of the ARB's has been to assure that peer review comments are adequately summarized and appropriately reflected in the recommended disposition of the proposal. This constructive support of the peer review process should be continued.[8]

C. CREATION OF OFFICE OF AUDIT AND OVERSIGHT AND COMMITTEE ON AUDIT AND OVERSIGHT

The Ad Hoc Committee on Action Review Boards was reconstituted in May 1977 [9] to review the continuing requirements for Action Review Boards. In September 1977, the Director told the NSB Executive Committee that he planned to establish an Office of Audit and Oversight and that the existing audit committee should be renamed the Ad Hoc Committee on Audit and Oversight.[10] The new office of Audit and Oversight was to be responsible for:

1. Post hoc sampling of proposal actions and post-award assessment of evaluation, documentation, and adherence to stated procedures.
2. Assessment of overall system performance and recommendations for improved and simplified procedures.
3. Investigation of charges of improper actions by NSF staff and monitoring of the decision/reconsideration system.
4. Financial audits.
5. Monitoring and coordination of procedures for scientific oversight undertaken by disciplinary advisory panels.
6. Evaluation and program audits.[11]

The new committee began to hold meetings in the spring of 1978. It had two principal tasks in addition to helping to establish the directions for the Office of Audit and Oversight. First, recognizing that Action Review Board procedures varied from Directorate to Directorate, it decided to assess such procedures to ensure that ARBs were used effectively and provided for essential pre-award quality control. Apparently some NSF staff members were using the ARB process only for proposals which would be presented to the NSB.[12] The second task of the committee involved post-research evaluation. The Committee agreed to:

(a) Obtain and examine the procedures employed by each directorate to maintain a high level of technical quality in all awards; and

(b) Examine procedures by which the Foundation monitors the integrity and propriety of the use of funds by principal investigators, from both the fiscal and the technical standpoints.[13]

The committee has functioned primarily as a quality control device. While it does not write procedures for ARBs, it typically evaluates the quality of ARB procedures in each directorate at least once a year, with the objective of providing a "reliability check on the staff in a non-threatening way." [14] Minutes of committee meetings indicate that its assessments of the ARB procedures seem to have compelled the NSF staff to improve them.

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[8] 185:31-32.

[9] 190: 16.

[10] EC: 77-9:2-3.

[11] Memorandum of Discussion, Fourth meeting, Ad Hoc Committee on Audit and Oversight, National Science Board, June 15, 1978, NSB/C-78-36, August 3, 1978. (C-78-26:2.)

[12] C-78-36.3.

[13] Ibid.

The committee also engaged in three other related activities:

It has assessed and approved modifications in ARB procedures in some directorates, since ARBs returned up to one-third of the proposals in these directorates, in effect calling into question the oversight procedures used.[15]

It has evaluated NSF's procedures to reconsider declined proposals by evaluating a sample of file folders of declined proposals, which potential principal investigators had challenged. The typical rate of declinations/reconsiderations was 40 per year at the Assistant Director level and six to seven per year at the Deputy Director level.[16] The Committee reported that it found existing procedures to be satisfactory.[17]

It has received a status report from the new Office of Audit and Oversight. The Office had evaluated a sample of 750 award jackets with the intention of identifying problems in review procedures and recommending ways to improve them and standardize procedures. It found such problems as: staff review only when external peer review also was required, incomplete files of previous contracts between PIs and NSF, some lack of uniformity in assembling of award file proposal jackets; excessive encouragement of withdrawals to avoid declination; actual or apparent conflicts of interest in peer reviewers; and selection of awards on the basis of criteria not specified in program announcements. The Office prescribed ways to overcome each of these problems, with the result that the Ad Hoc Committee reported that it "* * * is of the opinion that NSF now has in place an effective system to provide oversight of the audit and quality control of the grants and contracts process."[18]

The committee also discussed the processes that the staff had developed to design procedures to do post-research evaluation and to measure the quality of output of NSF-supported research in compliance with a directive in a Senate Appropriations Committee report which required NSF to establish a post-research evaluation mechanism to measure the value of NSF's investments in research.[19] Most of the work done in support of this recurring recommendation has been conducted by the NSF staff, with the Board playing only a small role.

In November 1978 the NSB raised the status of the committee from an ad hoc to a task committee on the ground of the continuing nature of its assignments.[20] In 1980 Dr. Branscomb raised its status to that of a standing committee.

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[14] Minutes of Eleventh meeting.

[15] (AAEO, BBS, and MPE) 200: 13 and minutes of the fifth committee meeting.

[16] Pursuant to Circular 108.

[17] 200: 13 and minutes of the sixth meeting of the Committee.

[18] 200: 14 and minutes of the sixth meeting of the committee.

[19] The requirement was first included in U.S. Congress. Senate. Committee on Appropriations. Subcommittee on HUD-Independent Agencies. HUD and Independent Agencies Appropriations for fiscal year 1979. Report to accompany H.R. 12936. Senate Report No. 95-1060, 95th Cong., 2d Sess., Washington, U.S. Govt. Print. Off., 1978.

[20] 202: 6.

XV. NSB COMMITTEE ON THE ROLE OF NSF IN BASIC RESEARCH

A. Introduction

The National Science Board's role relating to developing grant and contract mechanisms has been limited primarily to giving advice to the Director regarding the existence of a problem and then, after staff study, concurring with or perhaps refining mechanisms developed by the staff and the Director. The Board has dealt with most procurement issues in two committees—both of which were terminated in late 1980. These were the Committee on the Role of NSF in Basic Research, which dealt primarily with procurement issues related to universities, and the Committee on Big and Little Science, which was established to ensure the development of criteria and policies to provide an appropriate balance between support for individual project awards and large-scale program and project awards.

The activites of each of these committees will be addressed separately—the Committee on the Role of NSF in Basic Research in this chapter and the Committee on Big and Little Science in the next chapter.

B. Creation of the Committee

The Committee on the Role of NSF in Basic Research was created in 1974 at the recommendation of Long-range Task Force 74-C. Its function was to consider policies for maintaining the quality of basic research in universities. As of January 1980, its specific functions were to:

> Monitor NSF's role in support of basic research in the natural and social sciences,
>
> Examine factors affecting the quality of basic research being performed and identify problem areas and adverse trends, and
>
> Formulate mechanisms for Board consideration which will contribute to the general health of basic research.[1]

As is typical of other NSB committees, the NSF staff have played a major role in preparing most of the background and analytical studies necessary for the work of the committee. However, since one of the Board's major continuing goals has been to sustain the infrastructure of science—especially for the conduct of quality basic research in academic settings—this committee has played more of a role than other committees in initiating inquiries and in guiding NSF staff support. For instance, the committee's inquiry into the quality of basic research in universities led to a major staff study on the topic; it initiated efforts to alert heads of Federal agencies about the need to maintain adequate levels of support for basic research in mission agencies; it conceived the concept of creating departmental research centers (later modified by NSF staff); and it played a crucial role in starting inquiries into the problems of young investigators in universities. These efforts will be described next. The committee has not addressed all of the important procurement policies with which NSB has dealt. Some of these other policies are described also.

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[1] Memorandum: NSB Committee Structure and Membership, Jan. 23, 1980. NSB-80-45, p. 5.

C. STUDY OF FACTORS AFFECTING THE CONDUCT OF BASIC RESEARCH IN UNIVERSITIES

One of the committee's first concerns was to discuss the relative importance of factors which affect the conduct of basic research in universities and means to overcome problems which reduced the effectiveness of university research programs and limited faculties' ability to undertake basic research in new fields.[2] The committee concluded that the ability of universities to conduct research was constrained by a projected "flattening" of undergraduate enrollment and the decreasing number of opportunities for young faculty members. The Committee observed that "if universities are to continue to be the Nation's resource for basic research, there must be a decoupling of research and enrollment and it will be necessary to have a clear policy and an effective mechanism for maintaining a satisfactory level of graduate enrollment or providing alternative means of research support."[3]

The committee was particularly concerned with the vitality of faculty "(including the decreasing opportunities for new, young faculty, the abrupt and cyclical versus continuous replacement of senior faculty, and the increasing age of the faculty.)"[4] Therefore, in May 1975 it requested, and the Board approved, a resolution (NSB 75-178) requiring the NSF Director to undertake a study of the factors affecting the conduct of research in a sample of research-producing university departments in seven disciplines. The Committee assisted in designing the questionnaire used in the study and served as the principal advisory group to its executive secretary, who was the study director.[5] The study generated information on faculty-related changes which occurred during the early 1970s; the use of research faculty, postdoctorals and graduate students; the use of national laboratory facilities, and the availability of capital equipment. It showed that fewer graduate students were being supported than previously; there was an increase in older, tenured faculty; and there was a need for more "research continuation and stability."[6]

D. NEED FOR MORE BASIC RESEARCH IN MISSION AGENCIES

The committee was concerned also with the issue of increasing specificity and control of research. In 1974 the Board had sent letters to the mission agencies, urging them to recognize the importance of basic research in their areas of interest.[7] The aforementioned survey indicated that the more research-productive schools were concerned with this issue. The committee concluded: "The decrease in funding for basic research relative to that available for specific mission-oriented research programs, the increasing specificity and narrowing of agency missions, and the increasing emphasis on relevance, when combined with the dependence on Federal funds for university research, place strong pressure on faculty to undertake more applied research."[8] The Board subsequently issued an annual report on the subject entitled, *Basic Research in the Mission Agencies* (see chapter VIII), and a policy statement to encourage mission agencies to support basic research relevant to their function. (See Appendix B.) Also in early 1977, after the Board read a press release which indicated that the Department of Energy would not support basic research, it adopted a resolution requesting the Director to work with the President's science advisor and with the Administration to seek appropriate language for the Department of Energy to conduct basic research.[9] (Subsequently, in March 1979, after the Department of Energy had been established, the Director proposed and the Board endorsed a statement commending that agency for its program in support of basic engineering research described as "important to the success of many energy technologies and complementary to the broadly based engineering research program of the NSF."[10] (See Appendix B.)

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[2] Details of the Committee's activities to mid-1976 are taken from Summary Report of the Discussion of the NSB Committee on Role of NSB in Basic Research, Oct. 1974–April 1976. NSB/BR-76-19, Aug. 12, 1976. (Limited Distribution.)

[3] Ibid., pp. 1–2.

[4] Ibid., p. 2.

[5] Ibid., p. 4.

[6] ES: 178: 6–7, ES 181: 5, "Factors Affecting the Conduct of Research in Universities."

E. POLICY SOLUTIONS SUGGESTED

The Committee considered several types of support and programs to reverse declines in basic research conduct and cutbacks in faculty employment in universities:[11]

1. Departmental Research Centers

Its principal recommendation, that "the Foundation establish a number of Departmental Research Centers in a variety of disciplines * * *"[12] emanated from deliberations of its Subcommittee on Institutional Arrangements for Research and from discussions of the NSB Summer Task Force 75-B that dealt with the topic of Alternative Institutional Arrangements for Basic and Applied Research.[13] The committee intended that the program support proven performers on a sustaining basis and that it could "* * * further build those strong and proven research groups by providing them with research funds on a competitive but sustaining basis. Such a program would encourage increased local initiative, permit the departments to respond more rapidly to new research opportunities, simplify research administration, and allow the departments to fully develop their research potentials."[14] As conceived, the proposal would have provided about $40 million annually to 150 university departments: $250,000 per year to ten departments in each of 15 disciplines. These long-term grants would be for four years with a possible renewal for an additional year. It was proposed that support for such a program total approximately five percent of NSF's total budget.[15] The Board devoted about an hour to discussing problems which might arise with the program, including vulnerability to charges of "elitism," (2) probable lack of equitable geographical distribution, (3) low status of institutional or block grants, (4) lack of obvious priority, and (5) adverse budgetary impact on existing programs. The minutes report that the Board decided that "conceptually there is no problem with the thrust and intent of the Committee's proposal, but putting together a viable DRC [Departmental Research Centers] program will be a challenge." The committee was asked to reformulate the program for the Board's consideration.[16]

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[7] Letter from Dr. Hackerman to Agency Heads, Oct. 22, 1974. (Ibid., p. 24.)

[8] Ibid., p. 16.

[9] CS: 189: 11.

[10] CS: 204: 4. (NSB/Res-79-22/A.)

[11] Among the solutions discussed, but not recommended, were: development of research universities "in which research would be separated from education, especially undergraduate education, and the selection of national research centers, the equivalent of unversity departments, within the university, for support"; creation of senior research scientists grants, or a program of national scientists awards; alternative post-university reemployment for scientists with a plan to encourage early retirement; support for predoctoral students in research; revising NSF funding procedures to provide fewer, but larger grants; development of an award system which would permit younger researchers to compete for funds with people at the same level of experience; and increasing non-Federal sources of research support to universities. (NSB BR-76-19, op. cit., p. 18-23.)

[12] NSB BR-76-19, op. cit. p. 19.

[13] 186: 23.

2. Group Research Grants

At the September 1977 meeting, the committee reported to the Board that, as a result of the discussion and in cooperation with four members of the NSF staff,[17] it developed a new mechanism called "group research grants." One reason was that the term "department" in the original plan was considered to be "unduly limiting."[18] Group research grants would "combine into one administrative mechanism several [research] projects which ordinarily would be viable if supported separately. A single scientist would assume primary responsibility for the administration of the project and the negotiations with the supporting agency. [The awards] are intended to support the research of groups of scientists who themselves judge that the effectiveness of their research would be enhanced by group funding."[19]

The full Board discussed in detail four resolutions and background materials dealing with the proposal. There was some concern about the relationship between funds which go to a group and funds which go to a department, and about having a small number of highly visible awards. It also was decided that the "activity was not a new program as such, but rather an administrative mechanism for a designated purpose—that it would clarify present NSF procedures which already permit the making of grants to any group of investigators who submit a proposal." The Board voted to approve the guidelines for the program.[20]

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[14] NSB BR-76-19, op. cit., p. 3.

[15] Ibid., p. 20 and 186: 23, 24.

[16] 186: 23-27.

[17] 193: 11.

[18] 193: 11.

[19] 193: 10, 11.

[20] 193: 12.

F. EXAMINATION OF OTHER ISSUES: THE PROBLEM OF YOUNG INVESTIGATORS

The topic of young investigators in universities received considerable attention under the impetus of NSB member Rich who prepared several papers for the committee on the subject. Staff background materials supplemented this work. The committee subsequently adopted a resolution for a program to support a small group of young postdoctorals—about 500 young investigators who are the upper ten percent of the postdoctoral population, for up to three years, with a salary of about $12,000 per year augumented by a $300 stipend for materials and supplies.[21] A few months later, in November 1979, the committee announced that it would assess what other agencies were doing to respond to the problem of young investigators, such as the Research Career Development Awards program of the National Institutes of Health which was credited with diminishing the problem of finding research support for young investigators in the biomedical research area.[22]

During the September 1979 meeting, the committee received and discussed the reports of the National Academy of Sciences and of several NSF staff groups which were assessing the problem of young investigators and faculty.[23] Long-range task group 79-A discussed the problem and developed two alternatives to deal with young investigators and with departments overstaffed with tenured positions. The alternatives were to:

> Provide grants to young investigators, not yet at an institution, to cover 50 percent of their salary support for four years, competitively renewable once; and
>
> To provide grants for young investigators with tenure track positions, to be equivalent to full salary for a maximum of four years, competitively renewable once. As a condition of the award, the institution would agree to add a new assistant professor on a tenure track appointment and would agree to retain this individual for the duration of the award.[24]

The staff refined these ideas and presented the committee with a plan for a prototype program for research excellence that would provide awards to some 60 scientists.[25] The program was adopted after subsequent refinement by the Budget and Programs committees.

G. STUDY OF HOW OSHA REGULATIONS AFFECT BASIC RESEARCH

In March 1979, the Board adopted a statement responding to regulations that the Occupational Safety and Health Administration proposed on the use of toxic chemicals. The NSB statement underscored that the proposed regulations were intended to govern industry and not university research and teaching laboratories. The Board also stressed the need for an exemption for research and teaching laboratories pending the completion of a National Academy of Sciences study on laboratory safety. The committee continued to discuss the issue during 1980.[26]

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[21] NSB/Res-78-55. 198: 12.
[22] 202: 5, 203: 15.
[23] 204: 6-7, 209: 11.
[24] 207: quick memorandum, p. 11, 12.
[25] 209: 11.

H. RELATED ISSUES THAT THE COMMITTEE ON THE ROLE OF NSF IN BASIC RESEARCH DID NOT DEAL WITH

The Board has addressed several other procurement issues without benefit of discussion by the Committee on the Role of NSF in Basic Research.

1. Creativity Extensions of Awards

The House Committee on Science and Technology requested the NSF in 1979 to develop new ideas for funding and organization of NSF research support. NSB task group 79-C presented several options, the preferred one being an award mechanism to be called "creativity extensions."[27] This would award funds on the basis of quality of research in the preceding two years, rather than on the basis of a proposal review. The Board refined the staff plan (to require reporting to the Board as well as the Director), but then said that it did not believe its approval was required since the program was not new, but rather, implied a change in administrative procedures.[28]

2. OMB Circular A-21

Although some Board members objected to OMB Circular A-21, the Board reacted slowly, as detailed below, illustrating not only the difficulties the Board confronts in dealing with controversial issues, but also the Board's relative lack of independence from OMB, vis-a-vis the Director, on issues critical to science funding.

In March 1979, presidential science adviser Press, during a short presentation on the budget and the President's science policies, told the Board about the OMB's issuance of a revised Circular A-21 on "Cost Principles for Educational Institutions," dated February 26, 1979. Dr. Press said that "the views of the educational community had been respected in the final drafting of * * * this circular."[29] But in January 1980, almost a year later, several NSB members discussed with the Board the communications that they had received from researchers and academics objecting especially to revisions made to Circular A-21 regarding computing indirect costs. Drs. Massey and Mac Lane stated particularly that the method recommended to compute indirect costs would reduce the amount of money that goes directly into research, especially for fields which have high equipment utilization. The Director responded that NSF does not have an official role in preparing the guidelines, only an advisory role. But " * * * several years of discussion among many interested parties preceded the recent changes in this Circular."[30]

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[26] 214: 8.

[27] They were: creativity extensions (awards based on recent history of research productivity, rather than proposal review); continued experimentation with the "master grant" concept, examination of block grants; five-to-seven year grants; examination of a plan, called "the Pimental process," to support for another two to three years a small percent of three-year proposals of exceptional quality; variation in peer review procedures; and five-year rolling grants. (Quick memorandum of minutes of the NSB meeting of June 1979.)

[28] 208: 10-11.

[29] CS: 205: 4.

[30] 212: 14.

During the next Board meeting in February, Dr. MacLane led a discussion of the issue, based in part on a memorandum that he prepared. Among the topics of discussion were:

Concern with the new requirement for accounting for 100 percent of faculty time (since the distinctions between teaching and research often were artificial); and

The belief that changes to OMB Circular A-21 were made by business officers of universities who have a different perspective from faculty members and that OMB gave more weight to business officers 'views than researchers 'views.

Despite these problems, the Director stated that he did not believe that the Board should come to a decision on the Circular without further study. He suggested that the Board might utilize a special commission to study the issue, but "he cautioned * * * that this would be a major undertaking which would have to be agreed to by OMB before it was started."[31] Later the Director agreed to the Committee on Basic Research studying this issue. Dr. MacLane continued to press the issue and during the April Board meeting he drafted a resolution, with which the Board seemed to agree, that stated that while accountability was required, "* * * the proposed form of accountability required by A-21 was impracticable; hence, viable alternatives for suitable accountability need to be considered."[32] The Board did not issue a resolution; it heard a presentation by Dr. Cornelius J. Pings, director of the National Commission on Research, which studied this issue. In May 1980 (coincidentally the beginning of the tenure of new Board Chairman Branscomb), the Board finally adopted a statement on OMB Circular A-21. Its contents were incorporated into a letter that the Board Chairman transmitted to the Director of OMB.[33] The Board's position was that:

> * * * the provisions [of OMB Circular A-21] * * * represent the "procurement" approach rather than the "assistance" approach more suited to be supported by NSF grants.
>
> * * * The Board suggests that the rules as to compensation for personal services in the new circular * * * be temporarily suspended, so that during the suspension different institutions can propose and use various alternatives, as a test. The Board also suggests that the ultimate rules * * * might well allow more such flexibility for institutions. Also for purposes of personal services on direct cost, there should be a provision for simple certification by the investigator that he had devoted at least the fraction of time or effort charted to the grant. In the case of indirect cost, it should be possible to limit the accounting required to the personal services of interest to the Government * * *. This would leave to the institution the accounting for "major functions" * * *. Moreover, the Board suggests the possible use of alternative proposals in the

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[31] 213: 8-9.

[32] 215: 14.

[33] 216: 24. The resolution is NSB/Res. 80-50.

recent report, *Accountability: Restoring the Quality of the Partnership,* from the National Commission on Research.[34]

About three months later the Director told the Board that OMB was rethinking its position on the Circular and was determining the feasibility of using the statistical sampling for reporting under A-21, rather than requiring comprehensive reporting by all universities.[35]

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[34] 216: 31.

[35] 219: 4. (It is possible that the Reagan Administration may seek to terminate the reporting requirements of OMB Circular A-21 in an effort to cut back on the "paperwork" burden afflicting universities.)

XVI. AD HOC COMMITTEE ON BIG AND LITTLE SCIENCE

The Board created the Ad Hoc Committee on Big and Little Science in response to an external event—congressional questions about whether NSF, especially the Board, had established policies to determine the appropriate distribution between awards for "big" and "little" science. The issue which provoked congressional attention was an NSF budget request for funding to commence the Ocean Margin Drilling program (OMD), expected to have a ten-year life span and to cost over a half billion dollars. OSTP designated NSF as the lead agency on this project. In March 1978, the NSF requested $4.2 million for the fiscal year 1979 authorization to plan the project and carry out geophysical site surveys, but in March 1978, the House Committee on Science and Technology reported that it would allow only $1 million. "The Committee stated that the project had not been adequately justified, and therefore expenditures * * * should be limited. * * *" If further cautioned that future ocean drilling programs should be considered in an overall framework of "big science" and "little science," that priorities for "big science" had not been well-developed, that the Board had not given adequate attention to the OMD program, and that support for "small science" should not suffer. As a partial response, the Board created the Ad Hoc Committee on Big and Little Science,[1] whose position essentially was that such criteria should not be established and flexibility should be maintained.

Subsequently the Committee enlarged its focus to deal basically with oversight and refinement of new kinds of procurement mechanisms that the Director established. The Committee functioned primarily to refine the concepts after they were developed by NSF staff to ensure that they accorded with implied or enunciated Board policy. [This occurred with respect to some of the major initiatives discussed in this chapter: the policy statement on "big" and "little" science, policies for small awards, and the "master grant" concept.)

A. Creation of the Committee in Response to Congressional Concern

As noted above, in its report on the NSF authorization bill for the fiscal year 1979, dated March 20, 1978, the House Committee on Science and Technology criticized NSF for lacking a "unified policy" or "integrated measures" of the extent to which NSF or scientific efforts generally are devoted to "big" or "little" science. The Committee defined "big" science projects as those which use large and expensive equipment and "little" science projects as those "that can be done by one or a very few scientists and do not require the use of expensive scientific equipment."[2] The Committee faulted NSF for having "inadequate procedures for authorizing internally the initiation of new big science undertakings[3] and for not requiring congressional authorization" for them. Faulting in particular the NSF decisionmaking process on the OMD project, the Committee continued:

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[1] Another response consisted of subsequent rigorous Board oversight of the planning and initial implementation phase of the program prior to delegating authority to the Director to award funds for it. The Board's oversight was conducted first via the Programs Committee and then by an Ad Hoc Board committee created for that purpose. The Board's role has been limited basically to ensuring that other agencies involved in supporting the program would fulfill their commitments, and that funding for OMD would not damage other NSF core support responsibilities. The Board and the NSF staff relied on an external advisory committee for advice on the scientific aspects of the program. Despite these moves, the Congress has not authorized funding at the requested levels.

> There is no indication that the National Science Board * * * has authorized the project. There is no request for Congressional approval of the project itself. There is no discussion of what other "big science" projects will have to be forsaken if the deep sea drilling project goes ahead; the "next generation telescope" might be such a project.[4]

The House authorizing committee told NSF to develop measures of the cost of "big" and "little" science projects, using dollar costs for "equipment, operation, research work, and scientist-man-years, as well as a measure of the values of results from such science, such as major innovations per dollar or citations per dollar resulting from such support." It suggested that Congress require NSF to request specific authorizations for each new "big" science project and that careful analysis be undertaken to ensure that funding for "little" science projects, which are not as politically visible as "big" science projects, do not suffer. The committee also limited funding for fiscal year 1979 to $1 million for the deep sea drilling project and limited all expenditures for "big" science projects until the NSF established (1) policies and monitoring systems for its support of "big" science projects, "little" science projects, and the balance between the two, and (2) formal procedures for determining which "big" science projects the scientific community would like to undertake with NSF support, and for establishing priorities among those projects suggested.[5]

The NSB Planning and Policy and Budget Committees discussed this report at the September 1978 meeting and recommended the establishment of an ad hoc Board committee, including representatives from the Programs Committee, the Committee on the Budget, and the Planning and Policy Committee, to consider a response to the House committee as well as to define issues in terms of broader NSF policy. The Board created this committee pursuant to its adoption of NSB Resolution 78-96.[6] [The committee was terminated in 1980, shortly after Dr. Branscomb became NSB Chairman and reorganized the committee structure.)

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[2] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Science Foundation. Report to accompany H.R. 11400. Mar. 20, 1978. House Report No. 95-993. 95th Congress, 2nd session. Washington, U.S. Govt. Print. Off., 1978. p. 15.

[33] Ibid, p. 16.

[4] Ibid., pp. 15-16.

[5] Ibid., p. 15.

[6] 201: 13-14.

B. FUNCTIONS

1. Review of Draft Statement on "Big" and "Little" Science

The first task of the Ad Hoc Committee on Big and Little Science was to review a draft statement, prepared by NSF staff, giving the definitions of "big" science, policies regarding the balance between "big" and "little" science, and procedures for establishing priorities among "big" science projects. The Committee discussed the document during October and November and concluded that (despite congressional intent) the Board should not develop guidelines for distinguishing between "big" and "little" science, that such a determination should be left to the discretion of the Directorates and the Director, but that the NSF staff-prepared document "be utilized in informal discussions with the staff of the House Committee on Science and Technology and the Office of Management and Budget * * * [and] that this document be assigned simultaneously to the Planning and Policy Committee for consideration before it is formally brought to the Board with final recommendations for action."[7]

The Board approved the draft document at its January 1979 meeting. It dealt with definitions, policy guidelines, and procedures for planning and review. It did not specify that a fixed percentage of funding should go to "big" science projects. Instead, it called for flexibility, and said that "big" science projects which could not be accommodated with a directorate's budget should be recommended as special presidential initiatives or add-ons to the budget. It also established procedures which required more NSB review of "big" science projects, mandated that the Board consider them in budget-related long-range planning meetings (to look at the impacts on related fields of science and on the scientific community), and established the policy that program plans should include firm estimates of costs.[8] The Board sent the material to the House committee, which is reported to have called the statement "quite reasonable," but also stated that

> The Foundation should also study whether small grants can be made efficiently and effectively. The Committee reminds the Foundation that it wishes to be fully and currently informed on "big science" projects that are being contemplated.[9] (See Appendix B.)

2. Policies for Small Awards

In response, the Ad Hoc Committee continued discussing procedures and policies and asked the NSF staff to provide data on the support of "little" science.[10] The Ad Hoc Committee also considered policies governing the award of grants smaller than the NSF average, for example, grants of a few hundred or a few thousand dollars. In this connection, the NSF Astronomy Division asked the Ad Hoc Committee for its views about policies for regranting authority to permit a professional association to make small grants to individuals from a "block grant of $25,000." Specifically it asked the committee to consider the policies embodied in a proposal received in December 1978 from the American Astronomical Society, requesting $25,000 to establish a committee of society members to solicit and award some 30 grants of $300 to $1,000 for travel, computer time, and so on. The Committee reacted initially by saying that, while this might be a good idea since more good researchers are becoming associated with small schools, the award of such funds could compromise effective accountability procedures, since NSF staff might surrender too much responsibility for making decisions.[11]

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[7] NSB/Res-78-113, referring to the document NSB-78-428, 202: 16-17.

[8] Minutes of Ad Hoc Committee on Big and Little Science, Meeting 3, Mar. 15, 1979 and "Big" Science Policies and Procedures Statement, adopted by the NSB at its 203rd meeting, January 18-19, 1979.

[9] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Science Foundation. Report to accompany H.R. 2729, Mar. 21, 1979. House Report No. 96-61, 96th Cong. 1st sess. Washington, U.S. Govt. Print. Off., 1979. p. 25.

[10] Ad Hoc Committee on Big and Little Science, Third Meeting.

After considering an NSF staff background paper, the committee agreed to fund the program, as a one-year experiment, subject to close monitoring, and suggested that second-year funding should be considered if the society could raise matching funds from one or more private foundations. The committee cautioned that the experiment should not be considered as a precedent or basis for justifying similar activities in the future, since much larger policy issues would need to be resolved if NSF wanted to adopt a policy of allowing redistribution of awards—the so-called "mini-grant" mechanism.[12]

3. *Oversight of "Master Grant" Experiment Initiated by the NSF Staff*

In September 1979, the Ad Hoc Committee on Big and Little Science heard a briefing on funding mechanisms, which dealt primarily with the progress and future of the "Master Grant" experiment that NSF was conducting. This experiment was described as part of the Administration's efforts to reduce the complexity of grant instruments in relation to OMB Circular A–110 and the Federal Grant and Cooperative Agreement Act of 1977. The master grant process would award a single master grant to a university department for administrative purposes; however, under it funding would go to several different projects and principal investigators. The use of the master grant would minimize some of the burdensome accounting problems of time and resource allocation required for separate awards.[13]

According to an NSF administrator, the experiment would improve post-award administration in the following three ways since it would:

> (1) Provide the university a greater degree of flexibility in the management of its own affairs by delegating to it more authority and responsibility with respect to grants administration; (2) improve the accountability in the use of public funds; and (3) reduce the detailed reporting required by the Federal Government of colleges and universities.[14]

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[11] Ad Hoc Committee on Big and Little Science, minutes of third meeting. Mar. 15, 1979.

[12] Ad Hoc Committee on Big and Little Science, minutes of fourth meeting, May 17, 1979.

[13] 209: 12.

[14] 212: 11.

The committee was told that the experiment was being conducted at nine institutions and was "favorable to date." The staff reported that it might undertake a university-wide experiment beginning at the University of Florida. The NSB committee endorsed the procedure and stated that it favored amending NSF policies to include the master grant concept as normal NSF policy, but first that staff would have to clarify reporting processes to ensure accountability.[15]

The Assistant Director for Administration briefed the full Board on the status and use of the master grants a few months later at the 212th meeting. In addition to describing its purposes, he noted that the experiment currently was limited to awards made by the Division of Chemistry through chemistry departments at nine universities. The Association of American Universities was instrumental in developing plans for the experiment and participated in the selection process. He said that he "concluded that a six-month review of the experiment at four of the institutions revealed that by and large all parties concerned have found it satisfactory thus far."

Apparently this was the first time that staff explained the "master grant" experiment to the full Board, although it had been underway for over six months. The Board minutes indicate that "The Director noted he brought this to the Board's attention because it is a major change in the way NSF conducts its business with the academic community and is therefore something about which the Board should be informed."[16] However, the Board was not asked to approve the program formally.

4. *Industry/University Funding: Board and Staff Modify White House Funding Policy*

During its sixth meeting, the committee considered the issue of tax incentives, that is, whether there were any possibilities for a U.S. tax code change so that investment credit might be used to the advantage of university equipment leasing. The initial discussion revealed that there are many specific complications and problems. The committee also considered the issue of research equipment more broadly, in terms of whether changes or new financing measures (for example, treatment of depreciation) might ameliorate cost burdens.[17]

In October 1979 the head of the NSF Office of Planning and Resources Management presented the ad hoc committee with a staff report on a university/industry cooperative program. He reported that the activity grew from eight awards in 1979 to 57 awards in 1980 (totaling about $10 million). The committee was told that engineering awards dominate, that no viable proposals were presented in biological and behavioral sciences. Experience indicated that "industry has not had difficulty relating to the concept and that patent questions and apprehensions are resolvable." The staff was considering two guideline changes: (1) to raise the minimum industry match to 25 percent for large companies, while keeping it at ten percent for small companies, and (2) setting the internal match between program and special funds at a flat rate of 50 percent rather than the current practice of 75 percent special fund share for proposals greater than $100,000. "The sense of the committee was that the shift to [a] 25 percent external match was in the right direction and that in the future it might well be scaled toward 50 percent."[18]

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[15] 209: 12. Minutes of sixth meeting of Ad Hoc Committee on Big and Little Science.

[16] 212: 11.

[17] Minutes of sixth meeting of Ad Hoc Committee on Big and Little Science.

It appears as if the committee's activity had a direct impact on subsequent decisions made by the Director and the President's science adviser (or if not, that the Board, Director, and science adviser already were thinking alike). At the February 1980 meeting, the Director announced that the amount of cost-sharing in the industry/university cooperative research program would vary according to company size and R and D budget. Thus, the Board was asked to inform the respective scientific communities that while small businesses would be required to share at least ten percent of any cost, large companies having a significant research and development budget would be expected to provide 100 percent of their companies 'cost of the project.[19] During the March 1980 Board meeting, the Committee reported to the Board that it was concerned with the Administration's requirement, enunciated by the science adviser, that called for some industry participation to be 100 percent corporate-funded. It invited Dr. Press to discuss this issue.[20]

The resulting Memorandum of Discussion gives details of the decision:

> The committee felt that the Science Adviser's position reflected a misunderstanding of both the purpose of the activity and the nature of the supported work (basic research) and that a 100 percent funding policy would be detrimental. A more reasonable approach would be a funding scale entailing 50 percent for the top twenty research corporations, 25 percent for others, and 10 percent for small business.[21]

At the April 1980 meeting, the Chairman told to the Board that the issue concerning the percentage of industry funding for the University/Industry Cooperative Research program had been negotiated with the science adviser. "The result is a sliding scale based on corporate size," an outcome the Board and NSF staff preferred.[22]

5. Staff Study on High-Risk Research by Young Investigators

During its tenth meeting, the committee heard a report of the results of a literature survey undertaken by an NSF staff member of high-risk research undertaken by young faculty members. It showed that recent studies of the young scientists problem had not identified conservatism in research. The staff member also relayed the gist of his discussions with the NSF Advisory Council task force which was considering innovative research proposals in general, to the effect that the group would probably report a negative finding in this matter. The committee requested a written summary and a proposal for a possible modest field survey and other inquiries which might develop information in different disciplines and subdisciplines concerning the problem to be presented at the April meeting.

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[18] Minutes of seventh meeting of Ad Hoc Committee on Big and Little Science, October 18, 1979.

[19] 213: 11.

[20] 214: 9-10. Minutes of Tenth Meeting, Ad Hoc Committee on Big and Little Science, Mar. 20, 1980.

[21] Minutes of Tenth Meeting, op cit., p. 1.

[22] 215: 10.

6. Equipment Costs

The issue of equipment costs was raised at the April 1980 Committee meeting. During the meeting, it was reported that the Committee on the Budget informally requested assistance from the Ad Hoc Committee in strengthening NSF's ability to plan and to program for major equipment.[23] The staff presented the Committee with a short discussion paper, but the Committee reported to the Board that "* * * existing management systems, particularly the Long-Range Planning documents and the procedures mandated by the Board's big science policy, seemed adequate to the task. What seemed to be required was more emphasis on capital equipment within this framework." However, the Committee also noted that whether and how to retrofit big science management policies to ongoing programs was a task which remained to be confronted.

XVII. THE BOARD'S ROLE IN SCIENCE EDUCATION

A. Introduction and Summary

During the latter part of the 1950s and the decade of the 1960s, NSF established a number of support programs in science education at the undergraduate, college, and graduate levels, as well as at the institutional level (to improve facilities and capabilities of U.S. universities and colleges to prepare scientists). As a result, in the fiscal year 1970, NSF obligations for science education activities totaled over $120 million; obligations for institutional support programs totaled about $45 million. In all, obligations for these science education activities comprised about 36 percent of total NSF obligations.[1] It is generally acknowledged that, during the 1950s and the 1960s, the NSB played a major role in enunciating these program priorities for NSF and other government-wide policies for science education-related activities.

Although total NSF obligations more than doubled (in current dollars) during the 1970s, the Foundation's responsibilities for science education decreased dramatically during the decade. During the fiscal year 1979, NSF obligations for science education totaled about $80 million, or nine percent of total NSF obligations. Cuts were made especially in undergraduate instructional programs, and the institutional support program had been abolished.[2] The main reason for the cutback in insitutional programs appears to be the decision that OMB imposed on NSF to terminate the institutional program when it allocated to NSF large amounts of research funding for applied research in the early 1970s. The cutbacks in other science education efforts may have been due, in large measure, to the Board's disinterest in or deliberate de-emphasis of science education as a paramount NSF responsibility.

During the period 1968 through 1980, the Board appears to have taken a secondary role in matters of science education—especially pre-college science education and programs not having a direct relationship to scientific research. It often deferred on important issues to the NSF Advisory Committee for Science Education—a group which seems to have preceded the Board in policymaking for education and has often publicly encouraged the Board to play a larger role in this area. In the last twelve years the Board has not had a continuing committee in science education and, perhaps as a result, has tended to react after the fact to educational policy support issues whenconfronted with problems in NSF's science education activities or with cuts for science education. The most consistent policy on science education articulated by the Board is that NSF's core responsibility in science education should be to train science professionals and to augment the conduct of basic research in universities, which means program support primarily at the doctoral and post-doctoral levels. This is evidenced in NSB actions and policy statements. For instance, during a May 1980 presentation to the NSF Advisory Council, Board Chairman Hackerman said:

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[1] In addition to the institutional support, programs funded during the fiscal year 1970 were: Student Development: Science Education for Students, Undergraduate Education for Students, Graduate Fellowships and Traineeships, Other Fellowships—Postdoctoral, and Advanced Science Education Programs; Instructional Personnel Development: Institutes, College Teacher Program, Science Faculty Fellowships, and Advanced Science Education Programs, and Instructional Program Development: Course Content Improvement, Cooperative College School Program, Science Curriculum Improvement, College Science Improvement Program, Senior Foreign Scientists Fellowships, and Advanced Science Education Program. (U.S. National Science Foundation. National Science Foundation Annual Report, 1970. Twentieth Annual Report for the Fiscal Year Ended June 30, 1970. Washington, U.S. Govt. Print. Off., 1971. pp. 121-122. (NSF 71-1.))

[2] U.S. National Science Foundation. National Science Foundation Annual Report 1979. Twenty-Ninth Annual Report for Fiscal Year 1979. Washington, U.S. Govt. Print. Off., 1980. pp. 135-137.

> There has been a decline in the Foundation's responsibility in science education. Since the Department of Education is so new, the decline should not be ascribed to its initiation. I believe it has to do more with the perception of what can and can't be done in science education by a scientifically oriented Foundation.
>
> * * * I don't think the Foundation and the Board are comfortable with pre-13th grade science, with elementary and secondary school science education. Yet the principle that education by educationalists is not appropriate in the world of science, is one that I think continues to persist and is one of the reasons there is such a dichotomy in our thinking about science education.
>
> In the near future, the presence of the Department of Education will make some difference in this area, because if it's an aggressive department and goes about its business in the way I think it probably will, the question of whether NSF should focus on the college and university level, perhaps even postdoctoral, may well be resolved. That department should support elementary and secondary school science education. At the graduate level, science training and science education are synonymous * * *.[3]

In 1972 the Congress amended the NSF organic act to give NSF's science education function equal status with the agency's scientific research activities. (Sec. 8 of P.L. 92-372.) Since then the Congress consistently has raised NSF's science education support budget, especially for pre-college science education, above the amount requested by the Foundation. The Board has not mirrored this level of concern. Recently when authorizing the fiscal year 1981 budget, the House and Senate agreed to raise the NSF request for science education from $75.7 million to $91.2 million, specifying program priorities within the total figure.[4] The legislation also authorized NSF to expand programs for the support of minorities and women in science, directing that education activities receive more attention.

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[3] Comments by Dr. Norman Hackerman, at meeting of NSF Advisory Council, May 1980, pp. 1, 3, 4.

[4] U.S. Congress. Committee of Conference. National Science Foundation Authorization and Equal Opportunities in Science and Technology. Conference Report to accompany S. 568, Nov. 21, 1980. House Report No. 96-1028, 96th Cong., 2nd Sess., Washington, U.S. Govt. Print. Off., 1980, p. 12.

The Board's apparent lack of attention to science education during the 1970s may reflect a practical solution to resolving the dilemma of maintaining a delicate balance between policy governance and attention to administrative detail that constantly confronts the Board and is endemic to the activities of most governing boards. On the other hand, such de-emphasis may be deliberate policy choice. Regardless, as noted in this chapter the Board's deemphasis of science education has caused both the Science Education Assistant Directors and the Science Education Advisory Committee chairmen to encourage the Board to play a larger role in this area, especially to justify NSF's science education responsibilities in the face of OMB cuts. At the same time, some congressional committees have charged that the Board should include more precollege science educators as Board members. (See chapter XIII on membership of the Board.) Highlights of NSB involvement in science education are presented next.

B. EARLY POLICIES STRESS DOCTORAL AND POST-DOCTORAL TRAINING

In 1971 OMB forced the Foundation to cut its institutional support program as a condition for receiving additional funding to begin the Research Applied to National Needs Program—a program initiated after consultation with the Board but without receiving its formal approval. During the next several meetings, the Board tried to define its role in science responsibilities for science education, in order, possibly, to thwart externally imposed changes. (See chapter X.)

The Board focused on Federal support of U.S. academic science during its January 1971 meeting. In a policy statement approved unanimously during that meeting, the Board stressed that NSF should revive its attention to planning for science education, manpower, facilities, and institutions. The Board also stated that it committed itself to "lend what weight it has to the concept that Federal support of institutions of higher education on a major scale is critically necessary * * *." (See appendix B.)

The Board's next addressed to a major issue of science education came during its June 1972 long-range planning meeting. It issued a statement that the Foundation has three basic roles in education: to improve the quality of professional scientists, to improve the scientific literacy of nonprofessionals, and to improve the quality of general education. It also identified eight new kinds of science education efforts which it said the NSB Ad Hoc Committee on Science Education should consider as its main charge. It stressed that a basic obstacle to these plans is that, while OMB seeks innovative new efforts, OMB does not support sustaining grants. The June 1972 Task Force therefore reported that "OMB may have unrealistic expectations of what science and technology can contribute to improve quality and decrease the cost of education in the near term."[5]

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[5] ES: 148: 13-14.

In the NSF Authorization Act of 1973 (P.L. 92-372), the Congress amended the NSF organic act in order to overcome "any possible ambiguity in * * * interpretation" of the NSF's science education responsibilities.[6] It also stated that it wanted to "* * * make clear the intention to emphasize the authority of the NSF to support programs in science education independently of their immediate effects on scientific research potential,"[7] that is, to require support of science education programs not necessarily linked only to doctoral and postdoctoral science education. It amended section 3(a)(1) of the NSF organic act by "* * * inserting 'and science education programs at all levels 'after scientific research potential, and by striking out 'scientific activities 'and inserting in lieu thereof 'scientific and educational activities.' "[8]

A few months later, in February 1973, the Board was presented with several reports outlining NSF objectives for science education. According to the minutes, "these reports are not in agreement on all issues."[9] The reports were: a report of an NSB Ad Hoc Committee on Science Education; 1970 and 1972 reports of the NSF Advisory Committee for Science Education; a draft working paper prepared by a joint task force of the Office of Science and Technology and the Foundation; and a background document on the education programs staff prepared for the NSF fiscal year 1974 budget. The reports differed significantly on three major issues, with major disagreements most apparent between the positions of the Board and NSF staff.[10] The three issues were: "Is there a problem of scarcity and, if so, what are the priorities?" "What should be the management philosophy in making a connection between quality research and responsibility for science education?" "To what extent do the problems of women and ethnic minorities in science require explicit acknowledgement and action?"[11] The Board stressed support at the doctoral and postdoctoral levels, linked the quality of research to education while calling for decentralized accountability, and avoided the issue of minorities and women. But some NSB members, especially Dr. Harrison, called for a statement of explicit NSB involvement in all areas of science education and urged the Board to give more attention to pre-college science education and science education for non-scientists, as opposed to stressing doctoral and postdoctoral training.[12] The Board voted to endorse several explicit policy recommendations, but later that same meeting rescinded the vote on the grounds that an insufficient number of members were present; science education activities needed to be considered as part of the total NSF mission, not alone; the issue of minorities and women should be addressed; and more consideration should be given to the issues before the Board formulated a position on them.

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[6] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Authorization Act of 1973. To accompany S. 3511. Senate Report No. 92-918, 92d Cong., 2d Sess., Washington, U.S. Govt. Print. Off., 1972, p. 17.

[7] U.S. Congress. Committee of Conference. Authorizing Appropriations for Activities of the National Science Foundation. To accompany H.R. 14108. House Report No. 92-1265. 92d Cong., 2d Sess., Washington, U.S. Govt. Print. Off., 1972, p. 7.

[8] The new language reads:

"The Foundation is authorized and directed—(1) to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels in the mathematical, physical, medical, biological, engineering, social, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific and educational activities and to appraise the impact of research upon industrial development and upon the general welfare." (Sec. 3(a)(1) of P.L. 507, 81st Cong., as amended.)

[9] ES: 153: 1.

[10] ES: 153: 2-3.

[11] ES: 153: 2-3.

[12] Ibid.

At the next meeting the Planning and Policy Committee decided that the Board should formulate the objectives to be attained and, then, develop programs and activities to implement these principles. The PPC proposed four principles, which the Board subsequently accepted.[13] They were:

1. Science education programs should stress high quality doctoral and postdoctoral programs to produce the best basic and applied research talent in the country,
2. The connection between research and education of scientists should be strengthened,
3. The Foundation should increase scientific literacy, improve education via science and technology, monitor manpower, and provide training, and
4. Particular effort shall be made to resolve the special problems involved in science education for women and disadvantaged minorities.[14]

The NSF Director objected to public release of these objectives on the grounds that they were premature. Nevertheless, it seems that these principles guided NSB's philosophy for science education. The PPC also recommended, and the Board Chairman agreed, to appoint a permanent committee or subcommittee on education.[15] This was not done, however.

C. NSB Activities Related to MACOS

The Board's next major activity in science education occurred during the aftermath of the MACOS situation. As a result of this episode the Board was asked to play a larger role in science education activities, to formulate clearer policy statements regarding the role of NSF in science education, and to improve its oversight procedures and recommendations for improvement of NSF management and oversight strategies. (See chapter XIV on Audit and Oversight.) These issues will be summarized next.

MACOS is the abbreviation for a fifth-grade social studies curriculum entitled "Man: A Course of Study," which had been developed with NSF support. The curriculum materials were intended to demonstrate why and how humans act differently from animals. The course concentrated on the study of the culture of a primitive Eskimo tribe, the Netsiliks. It showed that, in order to survive in a hostile polar climate, the group had to adopt practices which might be considered inhumane or unacceptable in other societies (painful slaughtering techniques and different forms of family life and sexual behavior which often espoused values unacceptable to some Americans). In 1975, serious objections were raised about MACOS on the grounds that it was entirely inappropriate for the Federal Government to support the development of materials which might be offensive for use at the pre-college level, and that the Federal Government was inappropriately promoting the adoption of MACOS and probably other federally sponsored curricula through NSF. It also was widely held and subsequently acknowledged by NSF staff in congressional hearings that NSF program managers did not use proper procedures in selecting awardees—specifically that they overlooked unfavorable peer review comments that they had received. NSF staff also acknowledged that evaluations of this program were faulty. These objections were voiced in congressional forums, including special investigations by committees and the General Accounting Office and in authorization and appropriations hearings for 1976.[16]

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[13] ES: 154: 10.
[14] ES: 154: 21, Mar. 16, 1973.
[15] ES: 154 10.

These actions led ultimately to introduction of an amendment to the NSF House authorization bill which would have required that the Foundation submit all proposed grant actions to the Congress for consideration for 30 days, during which the Congress could disapprove the intended award. The amendment was not enacted. However, the NSF appropriations act for fiscal year 1976 eliminated funds for curriculum development implementation programs at NSF.[17]

The Director responded to the congressional concerns by creating an internal NSF curriculum review group, which included Board members, to report to the NSF Advisory Committee for Science Education. The Director also asked the Board to enunciate its policy position on the issues by responding to certain questions raised about the program in a letter written to the Director by Rep. Olin Teague, Chairman of the House Committee on Science and Technology, who was trying to resolve the matter.[18] The Board's position, in summary, was that:

> It had not read the materials therefore could not express a position on the scientific value or truthfulness of the material;
>
> Local, not Federal officials, should decide if the material is appropriate for fifth graders. The Board reaffirmed the then current policy that an appropriate disclaimer appear prominently on all curricular materials. The Board also agreed that the Foundation should not intrude into this process by sending a cautionary notice to all school districts in the country;
>
> The Director and the proposed NSF curriculum review group should investigate whether proper contracting procedures were followed in developing the implementation plan and whether NSF generally goes too far in its pre-college science education implementation activities;
>
> The Board should reconsider whether NSF has adequate evaluation procedures for pre-college science course development activities.[19]

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[16] For a discussion on the consequences, see: U.S. Congress. Senate. Committee on Labor and Public Welfare. Special Subcommittee on the National Science Foundation. National Science Foundation Authorization Legislation, 1976. Hearings on S. 3202, 94th Congress, 2nd session. March 1976. Washington, U.S. Govt. Print. Off., 1976. pp. 67–68.

[17] U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. The National Science Foundation and Pre-College Science Education: 1950–1975. Report prepared by the Science Policy Research Division, Congressional Research Service, Library of Congress. (Committee print) Washington, U.S. Govt. Print. Off., 1976. p. 6.

[18] ES: 171: 7–8.

[19] ES: 171: 8.

The NSF curriculum review group reported to the House Science and Technology Committee, the NSF Director, and the NSF Science Education Advisory Committee, the latter of which then reported its findings to the Board. With respect to procedural changes, the group recommended generally that NSF strengthen the development of the competitive basis of, and review processes for, pre-college science education awards and for examination of completed programs, and that grantees be made to comply with the existing NSF disclaimer provisions.[20] The Advisory Committee also made several policy recommendations to the Board. The Board Chairman appointed a five-member NSF Ad Hoc Committee on Science Curriculum Review to study these recommendations and to report proposed action to the Board in June.[21]

As a result of the Ad Hoc Committee's deliberations and subsequent Board refinement of policy recommendations, the Board adopted and sent three policy statements to Chairman Teague. They stated essentially: (1) that pluralism was required in education but that NSF has a responsibility to fund the development of curriculum materials and to create conditions allowing choices to be made about dissemination, but that it should develop administrative procedures that avoid the appearance of coercion; (2) on curriculum development, NSF has a responsibility to help develop scientifically sound curricula for the pre-college level, and for both future scientists and technologists, as well as for students who will not go on in science; and (3) on implementation of science curricula, that the Foundation has a responsibility to assist in developing sound curricula development alternatives, but should undertake a review to ensure that the materials have educational value and accurate scientific content, and that the Foundation provides opportunities for input in the curricula review process by representatives of the scientific, educational, child development, commercial publishing, and informed public communities.[22]

The Board also undertook several additional actions. It improved the rigor of oversight for all on-going and future curriculum development activities in February 1976 when it adopted a resolution to require the Director to conduct a de novo review of all active projects in curriculum development and also requested the Director to submit for Board approval all recommendations for additional funding of on-going curricula development projects and for the initiation of new curricula development projects.[23] At the request of the Director, the Board agreed to appoint an Ad Hoc Board committee to work with the Foundation staff to monitor the performance of the Action Review Boards. (See chapter XIV.) Also, at the request of the Director, the Board unanimously agreed to appoint an Ad Hoc Board committee to monitor for the Board the Foundation's response to the report of the Subcommittee on Science, Research, and Technology of the House Committee on Science and Technology on the subject of the NSF awards procedures, which resulted from hearings that the Subcommittee held in the summer of

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[20] ES: 173: 6.
[21] ES: 173: 6.
[22] Discussed in ES: 174: 7-8, 11-14 and The National Science Foundation and Pre-College Science Education. * * *, op. cit; pp. 201-202.
[23] ES: 179: 1.

1975.[24] Subsequently, the NSB decided to open peer review processes by providing the unsigned verbatim comments of proposal reviewers to grant applicants upon request, a decision first endorsed by the Planning and Policy Committee. The NSF staff opposed this policy at first, on the grounds that it would undermine the peer review process and create undue work burdens. (See chapter VI.)

A congressional study evaluating the MACOS episode looked at the Board's role in it and concluded that NSB policymaking was too shortsighted since the Board did not reexamine its policies on curriculum review and allowed NSF to mount efforts in curriculum implementation without announcing detailed policy guidelines. It also concluded that the Board did not pay enough attention to precollege programs and that it was not effective as a policymaking body in the area of science education.[25]

D. OTHER ACTIVITIES

1. Congressionally Mandated Resource Center for Science and Engineering

From time to time other science education matters came to the Board's attention, but were considered as "meeting report items" or were dealt with under the rubric of basic research. For instance, NSB member Reynolds reported to the Board at the September 1977 meeting on the NSF Advisory Committee for Minority Programs in Science Education. The Board was told that "the Committee discussed the establishment of the congressionally mandated Resource Center for Science and Engineering, how to involve minorities in civic enterprises, and how to maintain the interest of sixth and seventh grade minority students in science and engineering. The consensus was that there should be greater emphasis on pre-college, even pre-high school, programs for minorities in science and engineering." [26]

2. New Programs and Site Visits

From time to time, Board members have reported on their participation in program planning and oversight activities related to science education. For instance, in October 1975, the Programs Committee report included the following items:

> The Programs Committee reviewed and recommended Board approval of proposals and guidelines for the new Research Initiation and Support (RIAS) program. The Committee suggested that [members] when they attend advisory committee meetings * * * review with the staff the final guidelines for both RIAS and the Comprehensive Assistance to Undergraduate Science Education Program (CAUSE).
>
> * * * The Committee also discussed the possibility of difficulties with Ginn and Company if publication of minicourses which are nearly ready to publish under the Individualized Science Instructional System must be delayed. * * *[27]

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[24] ES: 179: 2.

[25] The National Science Foundation and Precollege Science Education, op. cit., pp. 10–11.

[26] 193: 19.

[27] ES: 176: 6.

Board reports often include discussion of site visits to resource centers mandated by Congress. For instance, Dr. Cota-Robles reported at the December 1979 meeting on a site visit to the Atlanta University Resource Center.

E. BOARD ACTIVITIES RELATED TO CREATION OF A DEPARTMENT OF EDUCATION

The next major Board activity relating to science education was the matter of creation of the Department of Education. Early in 1978, the Board discussed the Administration's plans to create the Department of Education. According to the minutes, "Dr. Shields voiced his concern that the Foundation's Directorate for Science Education would be included in such a reorganization. He stated that he hoped the Board would express its concern about the future of science education and adopt the position that it continue to remain [in NSF]." The Board agreed and subsequently arranged a series of meetings with appropriate officials to discuss the Foundation's role in the support of science education.[28] Then, on January 16, 1978, the President's Reorganization Project sent a memorandum to the NSF Assistant Director for Education asking for the Foundation's views on the possible impact on NSF of a proposed Department of Education. The Board did not issue a policy statement at this time.[29]

Later the Foundation learned that the Office of Management and Budget wanted the bulk of NSF curricula projects transferred to the Department of Education. This was reflected in the statement made by James T. McIntyre, Jr., Director of OMB, when he appeared before the Senate Committee on Governmental Affairs to present the Administration's position on S. 911, the proposed Department of Education bill:

> *Certain Science Education programs in the National Science Foundation.* Although we do not advocate the transfer of the entire Science Education Directorate from the National Science Foundation, we think that a Department of Education responsible for improving educational quality should directly involve science education programs designed to upgrade school and college curricula. However, we think that the graduate training and scholarship programs, which recruit and prepare scientists for the Nation's scientific research effort, should remain in NSF, as well as some smaller education programs directed at improving communications between the scientific and nonscientific communities.[30]

The Board was told that the planned OMB transfer would involve NSF science education funding totaling $65 million in the fiscal year 1979, along with an estimated 40 NSF personnel.[31] This was cut to $27.8 million in an amendment offered by Rep. Don Fuqua, Chairman of the House Science and Technology Committee, and to $24.4 million in an amendment offered in the Senate by Edward M. Kennedy, Chairman of the NSF Subcommittee of the Committee on Labor and Public Welfare.[32] The NSB took a positive stance on the issue of maintaining in NSF only those education programs heavily dependent on science or research, when confronted with the creation of the Department of Education. It recommended the transfer of some primary, secondary, and collegiate programs, which the NSF Director apparently opposed.[33]

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[28] CS: 187:5.

[29] CS: 195: 8.

[30] CS: 197: 4.

[31] CS: 197: 4.

During the April 1977 meeting, the Director reported to the Board that he had sent a letter to the President, dated April 10, restating his and the Board's position on the proposed Department of Education.[34] Apparently the Foundation got its way. Public Law 96–88, the Department of Education Organization Act of 1979, required NSF to transfer only two small programs as of April 1, 1980: (1) the Minority Institutions Science Improvement Program, budgeted at $5 million, and the Pre-College Teacher Development (K–4) Program, budgeted at $1.5 million.[35] However, the NSF lost its incumbent Assistant Director for Science Education, who transferred to the new Department as the presidentially appointed Assistant Secretary for Educational Research and Improvement.

F. EXPLICIT CRITICISM BY SCIENCE EDUCATION ADVISORY COMMITTEE

In January 1980 the Chairman of the NSF Advisory Committee for Science Education, appeared before the Board. He began his presentation by stating that the Advisory Committee viewed the Department of Education Act "as an opportunity to reexamine the role of science education within the Foundation and to bring to the Board's attention the need for this reexamination." He noted that this act, for the first time to his knowledge, clearly defined the areas of responsibility of NSF's Directorate for Science Education. He also stated that he hoped this presentation would heighten the concern of Board members in areas of science education where needs exist which currently are not being met." [36] In addition to his oral briefing, he distributed at the meeting an Advisory Committee prepared document, *Science Education in the 1980s*. He also presented the Board with three recommendations from the Advisory Committee, all of which called for increasing NSB and NSF support for science education. The Board Chairman assigned them to the committees as indicated:

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[32] 216: 10.

[33] CS: 196:17. After it received a letter from the director of the education study of the President's Reorganization Project advising that the NSF should not retain responsibility for all Federal science education programs, the PPC reexamined a statement it had prepared on the issue of science education (NSB 77–219) and concluded that no changes were recommended. The full NSB adopted the statement. (PPC meeting 49, Jan. 19, 1978, PPC 49: 2, CS: 196.)

The NSF Director and the NSB Chairman urged the PPC to take a more positive stance regarding NSF's responsibilities for science education, insisting that NSF should retain responsibility for all such programs except continuing reviews of core curricula which other agencies can do. The Board objected and prepared a position statement which the Chairman and Director could use as a basis for a joint letter to OMB and others. It read in part:

"To reiterate, where the educational process is directly dependent upon the research environment or where the scientific subject matter so dominates the educational effort that it is dependent upon the subject matter specialist, it is our judgment that the National Science Foundation should continue to be responsible for the educational programs that are now within it. On the other hand, where the objective is to maintain continuing review and revision of core curricula programs, it is our judgment that this could very well be managed as effectively by another agency." (CS: 196: 8, NSB/Res–78–41. The statement was released as NSB 78–150.)

[34] CS: 197: 5. (NSB–78–181).

[35] National Science Foundation. Justification of Estimates of Appropriations to the Congress, Fiscal Year 1981, pp. J–1, J–4.

[36] 212: 15.

> The NSF should accord a higher priority for science education and significantly increase its funding in substantial increments over the next four or five years. This new level of funding should be achieved without sacrifice of support to other essential Foundation activities. (Assigned to the NSB Committee on the Budget to be considered in the budget development activities.)[37]
>
> The NSB should initiate joint studies with the Advisory Committee for Science Education to relate more effectively science education programs to overall Foundation objectives and national needs. (Assigned to the PPC for report to the Board at the May 1980 meeting.)[38]
>
> Following these proposed studies, the NSB should generate a special major report on science education. (Assigned to the Planning and Policy Committee for report at the May 1980 meeting.)[39]

In June 1980, long-range planning task force 80-B discussed a background report prepared by NSF staff on "the development and maintenance of scientific careers," then prepared its own report and recommendations on the topic.[40] Of the Board report's several recommendations, one was "that the Foundation reaffirm its priority to science education." Another was that the Board should prepare a white paper "to define the scope, depth of commitment, position, and priorities" that the Board and NSF should give to science education. The task force also recommended that NSB establish a task force on science and engineering education to prepare the paper, and that the Board communicate with appropriate State and local educational entities to describe the Board's concerns with the present state of pre-college science education, and that it collect information from scientific societies regarding educational activities of its members. Subsequently, the PPC appointed a Subcommittee on Science Education to, among other things, prepare the white paper.[41] Later the Board Chairman expressed concern that the proposed white paper "did not cover graduate and postdoctoral education in science explicitly but seemed to concentrate instead on the secondary level." His concern seemed to be provoked by Board discussion of the report, *Science and Engineering Education: Report to the President for the 1980s and Beyond,* which was prepared jointly by the National Science Foundation and the Department of Education and released in October 1980. In response to his question, the Board Chairman "was assured by the vice-chairman of the PPC that the scope of the committee's work would cover the Foundation's commitment to * * * graduate education."[42]

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[37] 215: 6.
[38] Idem.
[39] Idem.
[40] NSB-80-230.
[41] 217: 18, 26, 37; 218:9.
[42] CS: 218: 7-8.

G. CRITIQUE BY ASSISTANT DIRECTOR FOR SCIENCE EDUCATION

Shortly before his departure from NSF to the Department of Education, Dr. James Rutherford, Assistant Director for Science Education, made a presentation to the Board in which he stressed that he "did not think the Foundation could any longer afford to pay slight attention to science education." He also "* * * noted his hope that [the proposed] cutback for science education would focus Board attention on science education with the same intensity that it has exhibited on such programs as OMD [Ocean Margin Drilling], the Mathematical Science Research Institute, and the Institute for Theoretical Physics."[43] He suggested several policy options:

> Maintenance of the same kind of policy for support of science education: "This would mean, in all probability, a continuation of the flat, weakly oscillating budget curve which SE [Science Education Directorate] has seen for the past ten years,"
>
> "The Board could decide in fiscal years 1982 and 1983 to increase the budget for SE to $150 million even if it would have to be done at the sacrifice of basic research budgets for those years, * * * in order to ensure that twenty-five years from now the Nation will continue to have high calibre researchers * * *",
>
> "NSF could decide to withdraw from science education," meaning a phase out of the Directorate for SE and the transfer of remaining programs to research divisions. "It would admit the realities of NSF support for SE and would allow the Foundation to concentrate on the support of basic and selected applied research," and
>
> The Foundation could accept modest SE budgets in the future ($75 to $100 million.) "* * * If this is the option * * * the Foundation should try to do something important for SE, e.g. reduce the number of programs from twenty-one to perhaps twelve, concentrate on fellowships and postdoctorals, career development programs, student summer programs, and undergraduate research participation * * *."[44]

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[43] CS: 214: 8.

[44] CS: 214: 8.

XVIII. ACTIVITIES RELATED TO SCIENCE AND SOCIETY

NSF and NSB activities related to science for citizens and science and society were, for the most part, thrust upon an apparently skeptical and reluctant Foundation by congressional action originating primarily in the work of the Senate Subcommittee on the National Science Foundation, of the Senate Committee on Human Resources. For instance, in 1975, the National Science Foundation Authorization Act, 1976, Public Law 94-86, Aug. 9, 1975, directed the Foundation—

> To prepare a comprehensive plan [to be submitted to the authorizing committees within six months] for the establishment and conduct of a "Science for Citizens Program." Such program shall be designed—
>
> "(1) to improve public understanding of public policy issues involving science and technology;
>
> "(2) to facilitate the participation of experienced scientists and engineers as well as graduate and undergraduate students in public activities, including community and citizens group activities, aimed at the resolution of public policy issues having significant scientific and technical aspects;
>
> "(3) to enable nonprofit citizens public interest groups to acquire necessary technical expertise to assist them in dealing with the scientific and technical aspects of public policy issues; and
>
> "(4) to provide grants and contracts to academic and other nonprofit organizations for the conduct of applied research designed to improve the effectiveness of the programs [conducted under the three preceding paragraphs]."

It also directed the NSF "to prepare a comprehensive plan to facilitate the participation of members of the public in the formulation, development, and conduct of the National Science Foundation's programs, plans and other findings * * *." [1]

The Board dealt almost exclusively with the second and third requirements regarding involving the public in NSF decisionmaking.[2] Its first reaction to this requirement took the form of deferring to the NSF staff, which held a series of meetings in seven cities during December 1975 to obtains views on the design and content of a responsive program. The staff developed nine program options, but apparently disagreed on which was preferable.[3]

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[1] Sec. 3 and Sec. 4 of Public Law 94-86, Aug. 9, 1975.

[2] The Senate subcommittee (in Senate Report No. 94-111) encouraged the NSB also to name more public members to the Board. The Board was not enthusiastic about this idea and, instead, the idea of creating an Advisory Council to the Director was promoted, to be comprised of public members and scientists—an idea which the Senate subcommittee later endorsed. (See chaper XIII.)

[3] ES: 178: 11.

Subsequently the staff developed a plan for NSF to begin, on an experimental basis, a series of NSB regional forums, whose aim would be to (1) increase scientific, professional, and citizen input to NSF program planning; and (2) to expand the information base to assist the Board in exercising its policymaking role. It was proposed that six forums be held over the next two years, possibly in cities where Federal regional offices are located. The NSF Office of Government and Public Programs would be responsible, directly or through a contractor, for planning and organizing the meetings.[4]

NSB participated in these forums in two ways: (1) by helping to set the agenda by designing a set of questions or policy issues that each forum might address, to supplement the topics identified by local planning groups, and (2) by having about four or five Board and/or former Board members at the meetings themselves.[5] Six forum meetings were held. Among the issues discussed were: the environment, energy, water, food, and social concerns. Generally the issues treated were developed on the basis of regional concern. The PPC also developed a plan to assess the utility of the meetings and recommended that, in the future, the Board should have a greater opportunity to plan the meetings it holds. A subsequent staff report dealt with the findings, merit, and future of these meetings.[6] The Board apparently endorsed the findings of the report and cited some of them in congressional hearings:

> Nearly 200 individual suggestions or ideas emerged at these first meetings, and they are included in the report. Some of the suggestions relate to current NSF programs, some would require new NSF programs or a change in policy, and the remainder appear to be more appropriate for other Federal agencies.
>
> * * * We have heard useful suggestions for new or expanded programs to increase the participation of Blacks, Chicanos, and other minorities, women, and the handicapped in science and engineering. * * *
>
> From our experience to date, several conclusions may be drawn about citizen participation in science policy formulation. First, some part of the public does want to speak out on science-related issues. The forums provide a mechanism by which they can be heard, and their views conveyed to several parts of the Federal Government. Second, the public represented by the participants, from a variety of backgrounds and interests, is sophisticated in its knowledge of regional problems and their relationship to science. Third, forum participants feel that the public should be involved in setting priorities in problem-related scientific research and in science education. They are inclined to leave basic research priorities to the scientific community. Finally, participants have generally positive feelings about science and scientific research. The whole experience in-

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[4] ES: 180: 18.

[5] 195: 2-3.

[6] U.S. National Science Foundation. Regional Forums of the National Science Board. An Experiment with Public Participation in Science Policy Formulation. The Final Staff Report on the Regional Forums Project. Washington, U.S. Govt. Print. Off., 1979. 60 p. (NSF 79-22.)

dicates a continuing need for scientists to communicate clearly and effectively with various publics.[7]

The report also raised the question about whether the forums were worthwhile in the sense of whether or not the people who attended them were sufficiently knowledgeable about science to have meaningful views and to express them. The Board examined the objectives, costs, and accomplishments of the seminars beginning with a PPC-designed evaluation that began in May 1977.[8] As for recommendations, the PPC told the Board that it should hold only one forum annually in the future. Its rationale was that the forum audiences did not represent all of NSF's "publics," just NSF supporters, and the staff time involved was too costly.[9] The Board adopted this recommendation and also a resolution which recommended that NSF play a more significant role in the future dealing with pre-forum planning and activity.[10] At this time, the PPC also recommended that the staff begin a concept-development study to plan for an annual meeting focusing on timely and appropriate policy of concern to the Board and the broader scientific community.[11]

Long-range planning task force 77-C addressed the question of the role of NSF and NSB in interactions of science and society. This resulted eventually in a decision for NSB to prepare an annual report on this topic. [The report was due in 1980, but has not been published yet.) Subsequently, the Board created a task Committee on Science and Society, charged by the NSB Chairman to: (1) review the Foundation's public information mechanism and processes; (2) consider whether the Foundation has available to it a systematic, regularized means of determining perceptions and needs; and (3) describe and assess the involvement of the nonscientific public in NSF programs.[12]

Section 5d of the NSF fiscal year 1977 authorization act required the Foundation to submit to the Congress a report of the NSF Science for Citizens Advisory Committee, containing an analysis of the Science for Citizens Program, established pursuant to Public Law 94-86, discussed above. The Director provided the Board with copies of the report in October 1977.[13] The NSB task Committee on Science and Society studied these proposals and offered its own recommendations to the Board for consideration.[14] The committee's tasks in late 1977 and 1978 also included: review of the Foundation's public information activities for the staff[15] in order to help identify more projects and information which might be released to the public[16] and examination of "whether the Foundation has available to it a systematic, regularized means of determining the perceptions and needs of existing and potential constituencies and of making appropriate recommendations.[17] The committee reported that it was "anxious to focus its attention on what it considered its most important assignment, i.e., those issues that relate to the long-range interrelationship between science and society." [18] Further, the committee catalogued and assessed the involvement of the nonscience public in NSF programs.[19]

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[7] U.S. Congress. Senate. Committee on Human Resources. Subcommittee on Health and Scientific Research. National Science Foundation Authorization Act for Fiscal Years 1979 and 1980 and the Women in Science and Technology Equal Opportunities Act. Hearings, 95th Congress, Second Session. Apr. 1978. Washington, U.S. Government Print. Off., 1978. pp. 57-60.

[8] 190: 8.

[9] 194: 13 and PPC meeting 48.

[10] 195: 20. (NSB/Res-78-7.)

[11] 195: 21.

[12] 194:17.

[13] 194: 10.

[14] Idem.

[15] 194: 17.

[16] 195: 22

During meeting 201, the Committee told the Board that its charge was "too narrow and * * * that it should have broad oversight and policy interpretation responsibilities for all programs concerning science and society, including those in ASRA and Science Education." [20] Apparently there was some feeling, however, about whether the Committee should be continued at all.[21] The Committee subsequently discussed the report of the NSF Advisory Council's Task Group 2, *Interaction Between the National Science Foundation and the Public* [22] and then, in April 1979, changed its status to that of a Subcommittee of the Planning and Policy Committee in an effort to ensure that its "deliberations can have a more direct impact on the policies of the Board." [23]

In January 1980, the PPC Subcommittee on Science and Society prepared a draft statement, later endorsed by the PPC and the full Board, to recommend that regional forums not be used in the future as a major vehicle to obtain public opinion. The policy statement indicated that the Board was concerned about the implications of mixing objectives. The Board reported that the public who attended the meetings viewed them as serving two purposes: to present public views on science priorities and to present public views about using science and technology to solve social problems. According to the Board, the second was not appropriate, although the public seemed to prefer it. Thus, instead of regional forums, the Subcommittee on Science and Society recommended experimentation with other means to gauge public opinion and to share concerns over the direction of NSF programs, policies, and priorities.[24] During the next year and one-half, the PPC Subcommittee continued its deliberations about which other forms of public interaction might be useful. It intended to submit recommendations to the full Board in the summer of 1981.[25] Some officials believe that NSF is complying with P.L. 94-86 by virtue of its creation of the NSF Advisory Council. (See chapter XIII.)

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[17] 196: 24.
[18] 196: 24.
[19] 201: 16.
[20] 201: 17.
[21] 205: 10.
[22] 203: 15.
[23] 206: 6.
[24] NSB Res-80-2.
[25] Interview with NSF official.

APPENDIX A

AGENDA AND ACTIVITIES OF A TYPICAL NATIONAL SCIENCE BOARD MEETING

An NSB meeting typically includes the following activities:

1. Regular Report Activities

a. Approval of the minutes of the previous meeting (which are prepared by the Board staff).

b. Reviews of the status of Board reports.

c. Identification and discussion of professional activities, meetings, attendance, and other important governmental and non-governmental activities of NSB members and high-level NSF officials (done as an honor and also in part, probably, to disclose information for the record to prevent conflicts of interest from arising). For instance, during meeting 207, it was reported that NSB member, Dr. Jewel Plummer Cobb, had been appointed by the Secretary of State:

> As a public member of the United States Delegation to the United Nations Conference on Science and Technology for Development. The Chairman of the Delegation is The Very Reverend Theodore M. Hesburgh, C.S.C., Member of the National Science Board from 1954 to 1966. The Conference will be held in Vienna in August 1979.[1]

At the 210th meeting it was also reported that:

> At the invitation of Mr. Doan, Dr. Pimentel, NSF Deputy Director, Dr. Hackerman, Dr. Richard S. Nicholson, Director, Division of Chemistry, Directorate for Mathematical and Physical Sciences (MPS), and Dr. Jack T. Sanderson, Assistant Director for Engineering and Applied Science (EAS), attended a conference on October 15–17, sponsored by the Dow Chemical Company. The subject of the Conference was "Advances in Chemical Science and Technology." The other 350 participants were invited from industry and academia. The Chairman stated that the meeting was very valuable in that it provided an opportunity for considerable exchange among the participants.
>
> Mr. Doan stated that the idea is to promote industry-university cooperation, with an aim toward industry funding university research to a greater extent than it is currently.
>
> Mr. Doan represented the Board, on behalf of the Chairman, at the annual meeting of the Association of Graduate Schools which was held at the University of Washington on October 7–9. The relationship between universities, the Federal Government, and industry served as the theme of the meeting.[2]

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[1] 207 : 3.

[2] 210 : 3–4.

d. Discussion or adoption of resolutions of honor, such as naming new scientific discoveries or topographic features for scientists or politically reknown individuals.[3]

2. Report by NSF Director

Each meeting also includes an extensive report by the Director of NSF, which typically contains:

a. A presentation of a list of all grants and contracts awarded since the previous meeting and on all proposals received, withdrawn, or declined.

b. Details on organizational changes that occurred within NSF and on NSF senior staff assignments, often down to division or section level. For instance, during meeting 217, the Director presented the Board with the following information:

> Effective April 27 the Division of Atmospheric Sciences, Directorate for Astronomical, Atmospheric, Earth, and Ocean Sciences (AAEO), was reorganized to create two new sections; (1) the Grants Programs Section which includes the programs of the disestablished Atmospheric Research and Climate Dynamics Research Sections; and (2) the Centers and Facilities Programs Section which includes management of the National Center for Atmospheric Research, the National Scientific Balloon Facility, and other facilities which fall under the purview of the Division. Dr. Eugene W. Bierly, Division Director, is Acting Head of both sections. . . .
>
> Effective May 4 Dr. Walter L. Gillespie was appointed Acting Assistant Director for Science Education. Dr. Gillespie has most recently served as Deputy Assistant Director for Science Education.[4]

The Director's report also includes:

c. Review and discussion, if warranted, of a summary prepared by the Congressional Liaison Branch reporting on congressional actions relevant to NSF and other agencies which support research that occurred since the last meeting. For instance, during the May 1980 meeting the Board spent time discussing the following legislative issues: (1) status and interpretation of H.R. Res. 513 on "Defining policies of the United States with respect to scientific and technical exchanges with the Soviet Union," and (2) discussion of the Board Chairman's preparation of a letter to Congressman Don Fuqua commenting on H.R. 7178, proposed legislation on multiyear R and D authorizations.

d. Status report on OMB and legislative action on the three budgets (three consecutive annual budgets) which the Foundation is developing at any one period of time, including an overview of congressional directives to NSF in authorization and appropriations reports.

e. Review of status of activities the Director is undertaking in response to congressional and executive direction. For instance, during the May 1980 meeting, the Board discussed the Director's responsibilities and the status of the annual reports and the five-year reports (a responsibility given to OSTP pursuant to P.L. 94–282, but transferred to NSF by executive order), a science and engineering education study that NSF was preparing for the White House, the status of pending U.S.-China scientific agreements, and NSF staff efforts and visits toward this end.

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[3] For instance, Board minutes indicate that at the 216th meeting in May 1980, the Board noted: "At the suggestion of Dr. Frank K. Edmundson, Professor of Astronomy, Indiana University, an asteroid has been named "Baboquivari" in honor of the Pagago Indian Tribe. 'Baboquivari' is the highest and most sacred mountain on the Papago Indian Reservation, on which NSF's Kitt Peak National Observatory is located."(216 : 4)

[4] 217 : 6.

The 214th meeting included a report by the Director on the status of NSF compliance with Administration guidelines regarding cutbacks in U.S.-U.S.S.R. activities.[5] During the 220th meeting, the Director asked the NSF General Counsel to report to the Board on NSF regulations on the rights of the handicapped. The General Counsel noted that the draft regulations previously approved by the NSB prior to issuance in the *Federal Register* in 1978 had been revised taking into account comments received.[6] NSF was seeking to include provisions which addressed the rights of handicapped persons in federally funded scientific facilities. Comments were requested from NSB.

The Director's report often also includes reports on official visits which the Deputy Director, or other senior Federal science officials have made to other countries. For instance:

> The Director reported that he and Dr. Philip Handler, President, NAS, represented the United States at a meeting in Bonn, Germany, on September 14–17. Participating in the meeting were representatives from organizations interested in the promotion of scientific research from England, France, Germany, and the Netherlands.[7]
>
> The Director accompanied Dr. Frank Press and a number of representatives from other Federal scientific agencies on a trip to Latin America to visit Barbados, Brazil, Peru, and Venezuela.[8]

The Director's report also includes information relating to NSF meetings with members of the scientific community, status reports on implementation of policies relating to the support of NSF-funded researchers, and background information on the progress of Federal efforts toward resolving a particular policy issue, for instance discussion of public criticism of highly visible NSF-funded activities, such as the educational television program NOVA. A few excerpts of minutes reporting on these and other items are included next:

> *NOVA*
>
> The Deputy Director reported that there has been some concern expressed regarding the objectivity of the newest NOVA release, "A Plague on Our Children." However, he did report that there has been agreement between the producers of NOVA (WGBH in Boston) and NSF on a review process through an advisory panel which will assure that the three principal criteria are adhered to: (1) balance, (2) objectivity, and (3) accuracy.
>
> *Physics Support*
>
> The Director has called a meeting on November 13, 1979, with some 15 physicists, who are drawn from various areas of physics, to discuss the Foundation's support of physics. All Board Members who are physicists have been invited to participate.
>
> *Rate of Pay for Principal Investigators*
>
> The Deputy Director reported that with the expiration of the appropriation act for fiscal year 1979 the limit on the rate of

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[5] 214: 6.
[6] 220.
[7] 208: 8.
[8] 210: 8.

pay of principal investigators supported under NSF grants and amendments has been removed. Appropriate future adjustments will be made, where necessary, via contact between program officers and individuals where there is an issue. The Board Chairman noted that this expiration is not retroactive to funding with fiscal year 1979 ,funds (*NSB-79-398*—distributed at the meeting).[9]

> *Rotator Conflicts of Interest*
>
> The Acting Director reported on the status of the review of procedures to avoid conflicts of interest, especially by rotators. The Foundation's response to the draft General Accounting Office (GAO) report, "The National Science Foundation Needs to Resolve Conflict of Interest Problems Associated with Grants to Short-Term Employees," includes strong support for the rotator program, agreement that NSF needs a strong conflicts of interest program, and notes the actions already taken by the NSF Acting Director (O/D 80-27 dated August 14, 1980). O/D 80-27 contained proposed actions, which have now been implemented, to strengthen Foundation policies and procedures as they relate to the handling of proposals and awards involving prospective employees or former employees of the Foundaton (distributed to the Board at its 218th Meeting via *NSB-80-337*). One action was the establishment of a staff task group to examine policies and procedures to ensure that the appropriate mechanism is in place to avoid conflict of interest problems, particularly for rotating program personnel. The Acting Director noted that this task group will report its findings and recommendations soon.[10]

The Director also reports to the Board on changes in administrative procedures affecting NSF employees and their working conditions. For instance, the following NSF policy regarding a "flexitime experiment" was reported at meeting 209 in 1979:[11]

> The Director called on Mr. Thomas Ubois, Assistant Director for Administration, to comment on the Foundation's plans for flexitime. Mr. Ubois stated that about a year ago special legislation was enacted that authorized agencies to participate on a voluntary basis in a three-year experiment designed to measure the effects of alternatives to the traditional work schedule. He stated further that the Foundation has agreed to participate and that the flexitime experiment will begin at NSF in early October.

3. Presentations by Other Agency Officials

Sometimes other agency officials make presentations to the Board regarding support for science and technology programs. For instance, the May 1980 meeting included a presentation by the Honorable Shirley M. Hufstedler, Secretary of Education, and a subsequent discussion with Board members about implementing programs to deal with science education activities transferred from NSF to the Department of Education when it was created. During the September 1977 meeting, the Board heard a presentation by Patsy Mink, Assistant Secretary of State for Oceans and International Environmental and State.[12] The U.S. Coordinator for the United Nations Conference on

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[9] 210 : 8.
[10] 220 : 9.
[11] 209 : 9.
[12] 193 : 23.

Scientific Affairs on mutual interests of NSF and the Department of Science and Technology for Development, Jean Wilkowski, met with the Board during the March 1978 meeting to discuss progress on plans for the conference held in Vienna in 1979.[13]

4. Reports on Board-Related Activities

The typical NSB meeting also includes the following kinds of agenda items that deal with NSB-related activities:

a. Executive Branch Activities.—Discussion of relevant proposed OMB actions which would affect NSF operations, such as the discussion at the May 1980 meeting of the Board's proposed reaction to OMB regarding its disagreement with OMB Circular A–21, which had already been issued relating to time and effort reporting required to audit activities conducted with federally awarded research funds;

b. NSB Committee Reports.—Detailed reports of the status of activities of NSB committees, made by the chairperson of each committee;

c. Attendance at Meetings.—Reports by the NSB members, or NSF officials if no NSB member was in attendance, on NSB attendance at meetings of the NSF Advisory Council, (which serves at the pleasure of the NSF Director) and of the NSF advisory committees. Except for National Research Centers site visits which the full Board attends (usually during the June long-range planning meetings), most site visits are usually attended at the level of one or two members per meeting. See table A.1, beginning on the following page, for details on attendance at visits and other meetings from mid-1975 to mid-1980.

Members who attend such meetings generally provide the Board Chairman with written reports. The brief statements given at the NSB meeting generally are descriptive and reflect the informational and honorary nature of many visits. A few examples of descriptions as they appeared in NSB minutes are given next:

> *Dedication Ceremony for Very Large Array—Socorro, New Mexico—October 10—Dr. Branscomb, Dr. Cota-Robles, and Dr. Rich*
>
> The Board Chairman stated that it was a distinct pleasure to participate in this ceremony. He noted that the Very Large Array is not the world's largest radiotelescope from the standpoint of total antenna area; but if one considers its resolving power (which is one-tenth of an arc second in certain configurations) and its spectral and configuration flexibilities, it is the world's premier astronomical instrument. It is an enormous tribute to Dr. David S. Heeschen, Director of the National Radio Astronomy Observatory from 1962 to 1978, and now Emeritus Director, and the many other individuals who conceived and formulated it over a period of time, especially inasmuch as it was accomplished within three percent of its original budget despite inflation. Dr. Branscomb stated this instrument will produce some exciting science and is an accomplishment of which the United States can be very proud.
>
> Dr. Cota-Robles stated that it was a great experience for him, particularly the fine presentations made during the dedication by Dr. Frank Press and Dr. Carl B. Heiles, Professor of Astronomy, University of California, Berkeley.[14]

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[13] 196: 24.

[14] 220: 15–16.

TABLE A.1. Site Visits and Other Trips Reported at NSB Meetings as Planned or Held by the Members of the National Science Board, by Date and Number of Attendees, June 1975-May 1980

First Reported as Planned at Meeting Number	Name of Site Visit	Number of NSB Members Planning to Attend	Number of NSB Members Who Attended If Known (Meeting Number at Which Visit Was Reported)
174	This meeting was held at the Univ. of California at San Diego and the Scripps Institution of Oceanography, June 18-20, 1975.	Full NSB	
175	Received a report from Drs. Hackerman and Cooke on an Alaskan trip	2	
175	Received a report from Dr. Harrison on an oceanographic trip	1	
	Site visit to Woods Hole Oceanographic Institution, Sept. 1975		1 (Mtg. 175)
	Site visit to Glomar Challenger, VA Nov. 1975		1 (Mtg. 177)
	Site visit to Kitt Peak National Observatory, Nov., 14-15, 1975		1 (Mtg. 177)
	Site visit to National Astronomy and Ionosphere Center, Jan. 1976		2 (Mtg. 179)
	Site visit to Cerro-Tololo Inter-American Observatory, Jan. 1976		2 (Mtg. 179)
	Site visit to International Institute for Applied Systems Analysis, (Conference), Vienna, Austria, May 1976		2 (Mtg. 181)
	Site visits to Clark Lake Radio Observatory, California; Very Large Array, N.M., March-May 1976		2 (Mtg. 181)
182	This meeting was held at the National Radio Astronomy Observatory-Green Bank, West Virginia, June 16-18, 1976.	Full NSB	
	Site visit to Woods Hole Oceanographic Institution for Dedication of R/V Oceana, August 3, 1976		1 (Mtg. 183)
	Site Visit to Dedicate R/V Wecoma, Newport, Oregon		1 (Mtg. 183)
	Site visit to Greenland regarding glacier research, August 6-9, 1976		1 (Mtg. 183)
185	Site visits to Materials Research Laboratories:		
	Univ. of Pennsylvania, Oct. 5-6, 1976	1	

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* Note: If no number appears in column, the number of members is the same as the number planning to attend.

	Cornell Univ., Oct. 11-12, 1976	1	
	Northwestern Univ., Oct. 21-22, 1976	1	
186	Brown Univ., Oct. 18-19, 1976	1	
187	Report on Antarctic Site Visit, Dec. 31, 1976 to Jan. 18, 1977		3 (Mtg. 187)
	Annual Review of National Research Centers:		
187	National Center for Atmospheric Research, Nov. 30, 1976		1 (Mtg. 187)
187	National Radio Astronomy Observatory, Apr, 25, 1977		1 (Mtg. 190)
187	National Astronomy and Ionosphere Observatory, Apr. 25, 1977		2 (Mtg. 190)
187	Kitt Peak National Observatory and Cerro Tololo Inter-American Observatory, May 6, 1977		3 (Mtg. 190)
189	Site visits to Materials Research Laboratories:		
189	Univ. of Massachusetts, May 10-11, 1977		1 (Mtg. 190)
189	Carnegie-Mellon Univ., May 26-27, 1977	N.A.	
189	Annual Review of National Research Centers		
189	National Center for Atmospheric Research, Mar. 28-29, 1977		1 (Mtg. 189)
189	International Phase of Ocean Drilling, Mar. 31-Apr. 1, 1977)		1 (Mtg. 189)
191	This meeting was held at the New Mexico Institute of Mining and Technology, June 23,-29, 1977. It included a site visit to the Very Large Array.	Full NSB	
192	Annual Review of National Centers:		
192	National Center for Atmospheric Research, June 21, 1977	1	
192	Sacramento Peak Observatory, June 24-25, 1977	4	
192	Langmuir Laboratory for Atmospheric Research, June 24, 1977	5	
192	Kitt Peak National Observatory, June 28, 1977	1	
192	NSF Polar Programs in Greenland, July 25-29, 1977	1	
192	Site visits to Materials Research Laboratories:		
192	Purdue Univ., Oct. 3-4, 1977	1	
192	Univ. of Illinois, Oct. 17-18, 1977	1	
192	Stanford Univ., Oct. 20-21, 1977	1	0 (Mtg. 194)

193	Users' Meetings		
193	Univ. of Wisconsin Synchrotron Radiation Center, Oct. 24-25, 1977	N.A.	
193	Stanford Univ. Synchrotron Radiation Project, Oct. 17-18, 1977	N.A.	
194	Status Report on Management, Operation, and Maintenance of Sacramento Peak Observatory	N.A.	
	Site visit to Antarctica, Dec. 12-17, 1977		1 (Mtg. 195)
	Site visit to Antarctica, Jan. 6-12, 1978		4 (Mtg. 195)
196	Annual Review of National Research Centers at NSF		
196	Deep Sea Drilling Project, Apr. 3, 1978		1 (Mtg. 197)
196	Kitt Peak National Observatory , Cerro Tololo Inter-American Observatory and of	1	3 (Mtg. 198)
	Sacramento Peak Observatory, held at NSF, May 2, 1978	2	
196	National Radio Astronomy Observatory	N.A.	1 (Mtg. 198)
196	National Astronomy and Ionosphere Center, held at NSF, June 19, 1978		1 (Mtg. 201)
	Site visit to Cerro Tololo Inter-American Observatory, Chile, Apr. 14, 19, 1978		1 (Mtg. 197)
	Review of International Phase of Ocean Drilling Program, held at NSF, Apr. 13-14, 1978		1 (Mtg. 197)
198	NSF Small Business Conference on Federal Research and Development, May 22-23, 1978	2	
198	SSRC Review of Science Indicators, 1976, May 12-13, 1978	1	
198	Annual Review of National Research Centers		
198	National Center for Atmospheric Research Briefing and Site Visit, Nov. 28, 1978	2	Site visit cancelled; meeting held at NSF, 2, (Mtg. 203)
199	Meeting held at National Center for Atmospheric Research, Boulder, Colorado, June 14-16, 1978	Full NSB	
	Site visit to Alaska: Univ. of Alaska, Naval Arctic Research Laboratory, Toolick Lake Field Station, Valdez Terminal of the Alyeska Pipeline and the Arctic Environmental and Data Center, Aug. 19-26, 1978		1 (Mtg. 201)
202	Curriculum exchange conference for Minority Institutions, Jan. 19-20, 1979	2	
	Site visit to Antarctica, Dec. 1978 and Jan. 1979		5 (Mtg. 203)

205	Annual presentation of Joint Oceanographic Institutions, Inc./Deep Sea Drilling Project, Apr. 2, 1979	2	Cancelled
206	Annual Review of National Research Centers at NSF		
206	Kitt Peak National Observatory, Cerro-Tololo Inter-American Observatory, Sacramento Peak Observatory, May 1, 1979	1	2 (Mtg. 207)
206	National Radio Astronomy and Ionosphere	1	2 (Mtg. 207)
	National Radio Astronomy Observatory at NSF, May 1979		2 (Mtg. 206)
207	Site visits to Materials Research Laboratories:		
207	Univ. of Chicago, Sept. 20-21, 1979		1 (Mtg. 210)
207	Cornell Univ., Oct. 4-5, 1979	1	Cancelled
207	Northwestern Univ., Sept. 24-25, 1979		1 (Mtg. 210)
207	Kitt Peak National Observatory Briefing and site visit, Arizona, June 20-22, 1979	Full NSB	
208	Engineering and Applied Science Small Business Conference on R and D:		
208	Boston, Sept. 6-7, 1979	2	
208	Dallas, Sept. 13-14 1979	1	
	Site visit to Antarctica, Nov. 28-30, 1979		3 (Mtg. 212)
	Site visit to Glomar Explorer and Glomar Challenger, in Long Beach, California, Aug. 30, 1979		3 (Mtg. 209)
	Dedication of Canada-France-Hawaii Telescope, in Hawaii		3 (Mtg. 209)
	Site visit to Univ. of Pennsylvania Materials Research Laboratory, Sept. 27-28, 1979		1 (Mtg. 210)
	Site visit to Brown University Materials Research Laboratory, Oct. 2-3, 1979		1 (Mtg. 210)
	Site visit to Atlanta University Resource Center, Nov. 1-3, 1979		1 (Mtg. 211)
212	Seminar on Distinctions Between Basic and Applied Research, Dec. 8, 1979	4	
212	Proposed Ocean Margin Drilling Program with academic representatives, Dec. 10, 1979	N.A.	
213	Briefing on Proposed Ocean Margin Drilling Program, Feb. 14, 1980	2	
213	Dedication of Electron Storage Ring at Cornell Univ., Mar. 25, 1980	1	
213	Annual presentation of National Center for Atmospheric Research at NSF, Apr. 14, 1980	1 1	

213	Annual presentations of Cerro-Tololo Inter-American Observatory, Kitt Peak National Observatory, and Sacramento Peak Observatory, at NSF, Aprl 28, 1980	1	
213	Annual presentation of National Astronomy and Ionosphere Center at NSF, May 5, 1980	N.A.	
213	Annual presentation of National Radio Astronomy Center at NSF, May 6, 1980	1	
215	SSRC Symposium on Science Indicators, 1978, May 16, 1980	3	
215	Second International Institute for Applied Systems Analysis Conference, May 19-22, 1980	1	2 (Mtg. 217)
215	Site visit at Atlanta Resource Center, Mar. 29, 1980	1	
215	OECD Meeting on Science and Technology Indicators, Sept. 15-16, 1980	2	
215	Dedication of Very-large Array, New Mexico, Oct. 10, 1980	5	
215	Annual Review of National Centers		
215	National Center for Atmospheric Research, Apr. 14, 1980	N.A.	2 (Mtg. 215)
215	Cerro-Tololo Inter-American Observatory, Sacramento Peak Observatory, Apr. 28, 1980	2	
216	Antarctic Development Squadron Six Change of Command Ceremony, California, May 30, 1980	1	
216	NSF Delegation Site Visit of German Fraunhofer-Gesellschaft Institute, June 9-14, 1980, West Germany	1	
	Annual Review of National Astronomy and Ionosphere Center at NSF, May 5, 1980		1 (Mtg. 216)

NSF Delegation Site Visit to Fraunhofer-Gesellschaft Institutes (FGI)—West Germany

Dr. Ragone site visited the FGI with Dr. Jack T. Sanderson, Assistant Director for Engineering and Applied Science, and Dr. Bodo Bartocha, Director, Division of International Programs, STIA. Dr. Ragone reported that the FGIs include approximately 28 institutes, with a combined budget of over 200 million Deutsche marks. They are similar to the Max Planck Institutes except that they are devoted to applied research. Dr. Ragone stated that they visited five of the institutes: (a) Non-Destructive Testing Institute in Saarbrucken; (b) Information and Data Processing in Karlsruhe; (c) Production Techniques and Automation in Stuttgart; (d) Applied Solid State Physics in Freiburg; and (e) Solid State Electronics and Technology in Munich.

Dr. Ragone stated that the visiting group's overall impression was that the FGIs were vigorous. They observed that few of the investigators were over 35 years of age. He noted that the FGIs have a high turnover rate, about 10% per year. The FGI laboratories are generally well equipped and have fine technical support.

In particular, it was agreed by both NSF and FGI that some Fraunhofer personnel should attend the next NSF review panel on productivity which would be held in October of this year. He also noted that the FGIs would like to invite participation by the United States at a meeting that will be held subsequently on Solid State Electronics and Technology. Dr. Ragone encouraged participation in this meeting.[15]

d. Site Visits and Annual Reviews of National Research Centers and Materials Research Laboratories.—This section of the Board meeting also normally includes reports by NSB members who attended annual reviews of NSF Research centers or of the Materials Research Laboratories (MRLs) at NSF or at the site itself. These reports are made to facilitate the Board's oversight responsibilities. The reports presented at NSB meetings are superficial. The written reports that members give to the Board probably contain more details. It is the Board's practice that the information is transmitted to the Programs Committee, which reviews awards to the centers. For instance, the following was reported in the May 1980 NSB meeting on an annual review at NSF of the National Astronomy and Ionosphere Center:

> Dr. Cooke reported a major theme of the discussion was the increased costs of providing adequate services required by the users. He noted that the discussion on recent developments and observations in the chemistry of space was particularly interesting. The problem of frayed cables was also discussed and the critical need to be aware of safety factors. A large portion of the discussion was taken up by the operational problems that the facility is experiencing.[16]

Other examples follow:

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[15] 217: 10–11.
[16] 213: 19–20.

Site Visit to Atlanta University Resource Center—November 1–3

Dr. Cota-Robles reported that the Atlanta University Resource Center has been in operation since July 1, 1978. The site visit team examined its performance using a set of six well-defined questions. The activities of the center are organized into a community component, a regional institutional component, and an Atlanta University Center component. He stated that in his opinion the center clearly meets the formal guidelines set down by NSF for such centers and, further, that the community and the Atlanta University components are well on their way to becoming outstanding examples of such activities. He noted that the regional component is the most difficult to organize because of its physical distance from the other institutions, as well as educational and stylistic differences between institutions.

Dr. Cota-Robles stated that the Atlanta Resource Center has developed an unusually effective communications system which has encouraged a widespread understanding and appreciation of the goals of the center throughout Atlanta.[17]

Reports on Site Visits to Materials Research Laboratories (MRLs)

Stanford University—September 25–26—Dr. Neal.—Dr. Neal reported that the aggregate materials research program at Stanford University is one of the Nation's largest such university programs in the United States. The composition of the site visit team seemed to represent well the interests of universities, industry, and national laboratories. Team members appeared to be well qualified to assess the quality and direction of the programs in the Stanford MRL. Dr. Neal noted that the MRL management sees a serious need for more support for instrumentation.

It believes that many of the most able students attend Stanford, that there exists an obligation to provide them with training using modern equipment, and that this is not now being done. There was also concern about the effects of OMB Circular No. A–21 on the ability of the center to continue to support its graduate students, who presently number 33. Dr. Neal concluded that overall the program appears to be a vigorous one. (Dr. Neal's written report was mailed to the Board on October 24 via NSB–80–450.)

b. Harvard University—October 3–4—Dr. Rich (October 4 only).—Dr. Rich reported that the MRL group at Harvard is small, but they emphasized to him the extent to which central facilities played a crucial role in bringing users together who otherwise would not normally get together. In his assessment, despite its modest size the quality of the group is high, and it appears to be a successful operation. In response to a Board member's question as to whether or not the research at the Harvard MRL was genuinely dependent upon the existence of the central facilities or if it could be done without funding via a block grant, Dr. Rich stated that he felt the block grant was absolutely essential for success of the activity.[18]

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[17] 211 : 13–14.

e. Programs Committee Actions.—This section of each NSB meeting also includes a presentation by the Programs Committee of award actions which require full Board approval. In the open Board session approval is sought only for awards which are interagency transfers of funds over the given dollar limits, additions to already funded awards, guidelines for new programs, and delegations of approval authority to the Director for new programs. (All other award approvals are handled in the closed session of the meeting.) The open session also includes reports from the Director on awards information items.

f. Public Program Reviews.—The Board meetings also include public presentations by NSF staff of program reviews (subsequent to a closed and apparently more candid presentation made to the Director's staff). Questions, however, could be raised about the effectiveness of these reviews for purposes of program oversight. These presentations are made irregularly; customarily they are the second part of a program review process initiated for purposes of the Director's oversight. The first part consists of a detailed, in-depth, and critical review of the program behind closed doors; the second part, the program review before NSB, apparently is not as critical and, according to some officials, is intended to be more of a "show and tell" presentation to inform Board members about the achievements made by researchers who have received program funding. Issues of management, administration, planning, and evaluation, which formed the core of the review before the Director, apparently are not included in the review made before the NSB. A list of program reviews is included as table A-2.

g. Members' Initiated Business.—Time is allocated at most meetings for issues that individual Board members believe require NSB attention. One recent example of these kinds of discussions follows. It deals with the impact of a California court case on agricultural research priorities:

> *California Court Case*
>
> The Chairman called attention to an article from the February 6 *Los Angeles Times* concerning the refusal of an Alameda County Superior Court Judge to dismiss a lawsuit challenging the University of California's farm mechanization research policy and accusing University officials of a conflict of interest.
>
> The judge ruled that the suit's allegations were sufficient to be brought to trial, rejecting a move by University lawyers to have the case dismissed. If the suit's claims are found to be valid, the judge said, the University could be required to ". . . restructure the methods and criteria by which agricultural research projects are chosen." The Chairman stated that this case may be of importance in the future public support of research.[19]

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[18] 220 : 16–17.
[19] 213 : 19–20.

TABLE A-2.—PROGRAM REVIEWS PRESENTED TO DIRECTOR AND SUBSEQUENTLY TO THE NATIONAL SCIENCE BOARD

Subject	Date of review to the office of NSF Director	Date of presentation to full NSB
Interdisciplinary research relevant to problems of society (IRRPOS).	Made, but exact date unknown.	
Oceanography	do	Nov. 19, 1970
Chemistry	do	Sept. 19, 1973
Intergovernmental science and research utilization	do	do
Mathematical sciences		Oct. 18, 1973
Chemistry		Sept. 19, 1974
Mathematical sciences		Oct. 18, 1974
Research applied to national needs (environment and social sciences).		Jan. 16, 1975
Materials research		Mar. 19, 1975
Graduate education		Mar. 20, 1975
Precollege education		Mar. 21, 1975
Polar programs		May 15, 1975
Oceanography		do
Social sciences		Sept. 18, 1975
Intergovernmental science and research utilization		Sept. 19, 1975
Science Resources studies		do
Undergraduate education		Nov. 21, 1975
Environmental biology		Jan. 16, 1976
Physics		Mar. 19, 1976
Social sciences		May 20, 1976
Antarctic programs		Sept. 15, 1976
Special review on international science		Sept. 16, 1976
Chemistry		Oct. 14, 1976
Materials research		Oct. 15, 1976
Science information	May 3, 1976	Nov. 18, 1976
Behavioral and neural sciences	Oct. 19, 1976	Feb. 3, 1977
Computer sciences	Nov. 16, 1976	Mar. 16, 1978
Exploratory research and systems analysis	Nov. 23, 1976	Apr. 21, 1977
Science education	Dec. 14, 1976	Feb. 1, 1977
Science and society	Feb. 10, 1977	Mar. 17, 1977
Government and public programs	May 17, 1977	Nov. 17, 1977
Astronomical sciences	July 1, 1977	May 18, 1978
Atmospheric sciences	April 4, 1978	April 20, 1978
Integrated basic research and applied research	May 17, 1978	August 17, 1978
Science education	January 10, 1979	January 18, 1979
Physiology, cellular, and molecular biology	January 25, 1979	May 17, 1979
Deep sea drilling		March 15, 1979
Chemical and process engineering	July 9, 1979	August 16, 1979
Policy research and analysis	April 12, 1979	September 20, 1979
Arctic research	August 3, 1979	October 18, 1979
Information science and technology	May 24, 1979	November 15, 1979
Electrical, computer, and systems engineering	October 20, 1979	January 17, 1980
Ocean sciences	February 5, 1980	March 20, 1980
Mathematical sciences	March 7, 1980	May 15, 1980
Electrical computer and systems engineering		August 1980
Source resources studies		October 1980
Ocean margin drilling		November 1980

h. Effects of the Government in the Sunshine Act on NSB Meetings.—The passage of the Government in the Sunshine Act has had a significant impact on NSB meetings, public attendance at meetings, and availability to the public of minutes of meetings. Between meetings, the NSB office staff sends Board members copies of relevant drafts or final documents or data which are intended for discussion at the forthcoming meeting. Also, the NSB staff prepares a document, called a "Board Book," prior to each meeting, which includes a precise statement of items which will be discussed at the forthcoming meeting. Prior to passage of the Government in the Sunshine Act, NSB meetings were, for all intents and purposes, closed to the public. Since passage of the Act, meetings have been opened somewhat, but many of the major Board decisions are made in closed sessions. Prior to NSB meetings Board background materials generally are not made available to the public. After meetings are held, most Board background material, with the exception of information concerning proposed awards and draft statements, generally are made available to the public. Since enactment of the law, the Board must determine which aspects of the next Board meeting will be open to the public, and make the appropriate public announcement in the *Federal Register*. The Board also has determined that all NSB committee and subcommittee meetings will be closed to the public to enhance the deliberative process. The Board has also instituted the practice of holding executive session closed meetings. The closed sessions of the Board meetings include three major categories of activity:

1. Discussion and action on proposed awards requiring NSB approval (NSF Circulars No. 76 and 107), properly closed under 5 USC § 552b(c)(4), (6), and (9)(B). An open meeting on those portions would be likely to disclose personal information and constitute a clearly unwarranted invasion of privacy; would also prematurely disclose the position of NSF on the proposals in question before final negotiations and any determination by the Director to make the awards, and so would be likely to frustrate significantly the implementation of the proposed Foundation action; and might also disclose trade secrets and privileged or confidential information obtained from the persons submitting the proposals in question.

2. Consideration of items on which recommendations are made to the President (for possible submission to the Congress), premature disclosure of which could frustrate implementation; properly closed under 5 USC § 552b(c)(9)(B). These include:

a. Proposed NSF budget requests (see OMB Circular A–10 and NSF Circular No. 22). Open deliberation and formulation of proposed budget requests would be likely to disclose their content prematurely before they can be considered by the Administration and the President and submitted to the Congress and so would be likely to frustrate significantly the proposed Board action.

b. Proposed future annual reports from NSB to the President for submission to the Congress. Open deliberation on and consideration of proposed reports would be likely to disclose prematurely the intended content of the reports before they can be considered by the Administration and made to the Congress and so would be likely to frustrate significantly the proposed Board action.

c. Proposed changes in legislation of direct concern to NSB/NSF.

3. Discussion concerning specific individuals, which could result in invasion of personal privacy, properly closed under 5 USC § 552b(c)(6), includes:

a. possible NSB Members;
b. possible NSB officers;
c. possible NSF staff.

An open meeting on any of these subjects would be likely to result in disclosure of personal information that would constitute a clearly unwarranted invasion of personal privacy. General policy discussions, including most of the long-range (non-budgetary) planning, belong in open session under Government in the Sunshine Act (GIS).[20]

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[20] Information provided by NSB.

APPENDIX B

NATIONAL SCIENCE BOARD POLICY STATEMENTS AND RESOLUTIONS

GENERAL DELEGATIONS OF AUTHORITY NSB-73-170

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 119TH MEETING ON JULY 19-20, 1968 AS AMENDED AT ITS 123RD MEETING ON FEBRUARY 13-14, 1969

Authorization to the Director and the Executive Committee of the National Science Board to Review, Approve, and Take Final Action on Contracts, Grants, or other Arrangements

The Board unanimously RESOLVED, that, in accordance with the provisions of Section 5(e) of the National Science Foundation Act, as amended, the Director of the National Science Foundation may make a contract, grant, or other arrangement, pursuant to Section 11(c) of the Act, as amended, without the prior approval of the Board, wherever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year, and the award is made pursuant to an established program of the Foundation;

RESOLVED, further, that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board shall act for the Board in those rare instances, including the approval of grants, contracts or other arrangements, where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director;

RESOLVED, further, that this resolution supersedes and replaces the resolution of the Board of September 11, 1964, on this subject (NSB-64-171), which shall henceforth be of no force or effect.

The Board unanimously AGREED that each resolution of the Board approving the commitment by the Director of a specific amount of funds by contract, grant or other arrangement shall, unless it specifically states otherwise, be deemed to include approval for the Director, at his discretion, to amend the instrument to commit additional sums, not to exceed 10 per cent of the amount specified, or to change the expiration date of the instrument.

NATIONAL SCIENCE FOUNDATION
OFFICE OF THE DIRECTOR
WASHINGTON, D.C. 20550

STAFF MEMORANDUM

O/D 70-20

GRANTS AND CONTRACTS June 22, 1970

Subject: Implementation of NSB Resolution of July 20, 1968 establishing the authority of the Director to approve grants, contracts and other arrangements

Pursuant to Section 5(e) of the NSF Act, as amended in 1968, the National Science Board, on July 20, 1968, adopted a Resolution as follows:

> "RESOLVED, that, in accordance with the provisions of section 5(e) of the NSF Act, as amended, the Director of the Foundation may make a contract, grant, or other arrangement, pursuant to section 11(c) of the NSF Act, as amended, without the prior approval of the Board, wherever such an award involves a total commitment of less than $2,000,000 or less than $500,000, in any one year, and the award is made pursuant to an established program of the Foundation;
>
> "RESOLVED, further, that the Executive Committee of the National Science Board shall act for the Board in those rare instances, including the approval of grants, contracts or other arrangements, where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director; ..."

A. Guidelines

The following guidelines should be followed to ensure that the spirit of that resolution is met:

(1) No press release or other public announcement of a new program should be made until the new program has been specifically approved by the Board. No final action should be taken on grants, contracts or other arrangements relating to a new program until the Board has given its specific approval to the action or has approved the Program and authorized the application to it of the Director's general authority to approve such transactions.

(2) If a grant, contract or other arrangement can be reasonably expected to exceed $2 million over a period of time, taking into account, at the time the initial grant or contract is made, any expected renewal or extension of such grant or contract, Board approval of the initial grant or contract should be obtained before any award is made. In the past I have, on occasion, had to seek Board approval of a grant or contract renewal as the total funding of the project over a period of years was about to exceed $2 million. This procedure subverts the spirit, if not the letter, of section 5(e) and the Resolution of July 20, 1968, and should be avoided.

(3) Finally, in keeping with the spirit of the Act and the Resolution, any grant, contract or other arrangement which approaches, but falls just short of, $500,000 in any one year, or $2,000,000 in total should generally be submitted to the Board for approval. Of course, judgment and discretion will have to be exercised in such matters.

Form of Resolutions

In this connection the Board Office has received a number of inquiries recently regarding the proper format of resolutions for Board action. Given below are sample resolutions to be used in presenting proposals or programs to the Board for approval:

1. Single Proposal

RESOLVED, that the Board approves
the making by the Director at his
discretion of a grant or a contract
to (institution) for
" Title "
in an amount not to exceed $______
under the direction of Dr.(s)______
for a period of ___ year(s).

2. Several Proposals

RESOLVED, that the Board approves the making by the Director at his discretion of the following grants or contracts on the terms set forth below:

Organization	Investigator	Title	Duration	Amount not to Exceed
xx	xx	xx	x yr.	$

3. New Programs

As indicated above, no press release or other public announcement of a new program shall be issued until the program has been specifically approved by the Board. A program should be submitted to the Board for approval along with proposed guidelines. The following resolution may be used in such instances:

RESOLVED, that the Board approves the ________ Program, the general guidelines for its management as submitted to the Board, and authorizes the initiation of the program by solicitation of proposals.

Initial grants must then be submitted to the Board for approval irrespective of the amounts involved. When it is believed that a sufficient number of proposals have been approved by the Board to define the general parameter of the program then the Board may be requested to authorize the application of the Director's general authorization to approve grants to the new program. The following resolution may be used at this stage:

RESOLVED, that the Board, having approved the general guidelines for the ________. Program, and the general nature of the proposals submitted to the Board, hereby authorizes the application to this Program of the general authority of the Director, under the Board's Resolution of July 20, 1968, to take final action on grants, contracts, or other arrangements without the prior approval of the Board. Re

In the event you are uncertain regarding the appropriate language for a resolution, please contact the General Counsel's Office or the Board Office for guidance prior to submitting for the Director's signature a memorandum calling for Board action.

W D McElroy
W. D. McElroy
Director

DELEGATION OF AUTHORITY TO EXECUTIVE COMMITTEE

The General Counsel called attention to the problem of obligating fiscal year 1974 funds prior to July 1, 1974, in view of limited Board meetings now scheduled for April and June. He proposed that the delegation of authority to the Executive Committee to approve grants and contracts be broadened to permit its consideration of urgent proposals between regular Board meetings (as set forth in NSB-74-17--distributed at the meeting).

After a brief discussion during which it was requested that any such action in this regard be reconsidered if and when annual funding restrictions are lifted, the Board acted as follows:

> The National Science Board unanimously AMENDED the second paragraph of the resolution approved by the Board on July 20, 1968, delegating certain authority to the Director and to the Executive Committee to read as follows:
>
> RESOLVED, further, that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board may act for the Board between meetings of the Board in approving grants, contracts, or other arrangements where such approval is required by the Act or other rules of the Board, and it may act for the Board between meetings of the Board on other matters in those rare instances where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director.

In taking the above action it was understood that: (a) any member of the Executive Committee may request that any proposal be referred to the entire Board for approval; (b) the Chairman of the Programs Committee will participate with the Executive Committee in such proposal review; (c) the Executive Committee will inform the Board at its next meeting of all approvals made on behalf of the Board pursuant to this delegation of authority; and (d) this delegation will be reconsidered if the annual funding restriction is lifted.

The Board also discussed briefly a possible change in the statutory dollar limits on its delegation to the Director to approve grants and contracts. The staff is to prepare a study of the matter and make recommendations to the Board.

DELEGATION OF AUTHORITY FOR GRANT AND CONTRACT APPROVAL DELEGATION

The General Counsel raised the subject of broadening the delegation of authority to the Executive Committee for grant and contract approval in view of the restrictions placed on the Foundation through the annual expenditure of its funds and the increased workload because of larger budgets. The Committee instructed the General Counsel to prepare a resolution for Board consideration for this purpose. The General Counsel reported that a suggestion had been made in Executive Council that legislation be sought raising the present statutory limits on the delegation of authority to the Director to approve grants, contracts, or other arrangements. The staff can make a study of the volume of large grants and contracts and recommend to the Committee a reasonable but helpful dollar limit. If an increase seems to be necessary and desirable, legislative changes in the amount of the delegation can be recommended. In this connection it might be desirable to consider other steps which would result in more general program review by the Board.

ES:163:15

DELEGATION OF AUTHORITY

On recommendation of the Executive Committee the Board authorized the Director to seek congressional action to remove the statutory dollar limitation on its power to delegate project approval authority to the Director with the understanding that the Board will continue to review programs and individual projects within them when it considers such review to be desirable. Copies of a staff study furnishing background information on the number of proposed actions statutorily required to go to the Board for approval since fiscal year 1969 and projected through fiscal year 1975 were distributed at the meeting (NSB-74-91).

ES:163:11

NSB-74-95

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 119TH MEETING ON JULY 19-20, 1968, AS AMENDED AT ITS 123RD MEETING ON FEBRUARY 13-14, 1969 AND ITS 162ND MEETING ON FEBRUARY 21-22, 1974

Authorization to the Director and the Executive Committee of the National Science Board to Review, Approve, and Take Final Action on Contracts, Grants, or Other Arrangements

The Board unanimously RESOLVED, that, in accordance with the provisions of Section 5(e) of the National Science Foundation Act, as amended, the Director of the National Science Foundation may make a contract, grant, or other arrangement, pursuant to Section 11(c) of the Act, as amended, without the prior approval of the Board, wherever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year, and the award is made pursuant to an established program of the Foundation;

RESOLVED, further, that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board may act for the Board between meetings of the Board in approving grants, contracts, or other arrangements where such approval is required by the Act or other rules of the Board, and it may act for the Board between meetings of the Board on other matters in those rare instances where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director;

RESOLVED, further, that this resolution supersedes and replaces the resolution of the Board of September 11, 1964, on this subject (NSB-64-171), which shall henceforth be of no force or effect.

The Board unanimously AGREED that each resolution of the Board approving the commitment by the Director of a specific amount of funds by contract, grant or other arrangement shall, unless it specifically states otherwise, be deemed to include approval for the Director, at his discretion, to amend the instrument to commit additional sums, not to exceed 10 per cent of the amount specified, or to change the expiration date of the instrument.

NSB-77-245

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD
AT ITS 189TH MEETING ON APRIL 21-22, 1977

Authorization to the Director and the Executive Committee of the National Science Board to Review, Approve, and Take Final Action on Grants, Contracts, or Other Arrangements

The Board unanimously RESOLVED that:

(1) The Director of the National Science Foundation, without the prior approval of the National Science Board, may make a grant, contract, or other arrangement whenever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year and the award is made within an established program of the Foundation previously approved by the Board.

(2) Each standard grant, continuing grant, cooperative agreement, contract, or other arrangement (as defined in staff memorandum O/D 76-42, dated August 2, 1976) is to be considered separately and as a whole in determining whether the commitments involved exceed the $2,000,000 cumulative limit or the $500,000 annual limit. But, if simultaneous or successive awards are to be made for the same principal investigator based on only a single complete peer review or a single procurement, the simultaneous or successive awards shall be considered to constitute a single award in determining whether either limit is exceeded. Such successive awards based on a single complete peer review or a single procurement are to be considered as involving a total commitment of more than $2,000,000 as soon as program staff anticipates that the total ultimately committed is likely to exceed $2,000,000.

(3) The Executive Committee of the National Science Board may approve grants, contracts, or other arrangements where Board approval is required, or otherwise act for the Board in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director.

(4) When the National Science Board approves the commitment by the Director of a specific amount of funds by grant, contract, or other arrangement, unless the Board specifically states otherwise, the Director may at his discretion subsequently amend the instrument to commit additional sums, not to exceed 10 percent of the amount specified, or to change the expiration date of the instrument.

(5) This resolution supersedes and replaces the resolutions of the Board on this subject adopted in July 1968 and amended in February 1969 and February 1974.

AMENDMENTS TO NSF ACT

The General Counsel presented a proposed bill to amend the National Science Foundation Act of 1950, as amended (NSB/EC-74-13--distributed at the meeting).

Sections 3, 4, and 5 of the proposed bill regarding the Board were suggested by the Board Chairman. Proposed Sections 2 (Trust Fund) and 6 (delegation to the Director) were previously presented to the Committee in principle and approved by the Board. Proposed Section 7 is partly technical editing of the NSF Act and partly a Tydings type amendment to provide that appropriations will be available for obligation for two years instead of one year. This portion of Section 7 was suggested by the Minority Staff Director of the Senate Committee on Labor and Public Welfare. Proposed Section 8, which moves the Science Information Service into the basic Act, was also suggested by him in order to clean up the body of statutes on education rather than to improve the NSF Act. Actually it does both.

The General Counsel stated that the proposed statutory changes will be placed in priority order.

The Executive Committee recommended that the Director present the statutory changes outlined in the proposed bill to the Office of Management and Budget and the appropriate congressional committees.[1]

Major proposed amendments are: delegation of authority to the Director to approve grants and contracts; two-year obligational authority; Board Members and officers to serve until successors are appointed or elected; Board elections to be held in odd-numbered years; removal of deadline for submission of Board's annual report.

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[1] An additional amendment was proposed following the meeting which would provide that Board Members remain in office until their successors are sworn in as Members. The Board Chairman endorsed this additional amendment.

BIENNIAL REVIEW OF DELEGATIONS OF AUTHORITY

At the Twenty-sixth Annual (181st) Meeting, May 20-21, 1976, the Chairman proposed that the Board review on a biennial basis its current delegations of authority to the Director and the Executive Committee and, further, requested the General Counsel to prepare such memoranda for Board consideration.

The Chairman had earlier asked the Programs Committee to consider the 1978 list of delegations (NSB-78-217--Members' Books, Tab G), prepared by the General Counsel.

Following consideration, Dr. Shields, Chairman, reported that the Programs Committee recommended the continuation of all existing delegations of authority to the Executive Committee and the Director. The Board then acted as follows:

NSB/Res-78-58

The Board unanimously AFFIRMED the outstanding delegations of authority to the Director and the Executive Committee as set forth in Attachments 1, 2, and 3 of NSB-78-217; further, the National Science Board AFFIRMED the application to the programs set forth in Attachment 4 of NSB-78-217 of the Director's general authority to take final action on grants, contracts, or other arrangements pursuant to the Resolution of April 21-22, 1976.

198:19

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

nsf

OFFICE OF THE
DIRECTOR

NSB-76-165

May 19, 1976

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

Subject: Biennial Business -- Review of delegations of authority from the Board to the Director and/or the Executive Committee

The Chairman has suggested that the Board review biennially the delegations of authority it has made to the Director and to the Executive Committee. The following delegations of authority are outstanding:

The Director

- The Resolution of July 19-20, 1968, as amended on February 13-14, 1969, authorizing the Director to review, approve, and take final action on contracts, grants or other arrangements under established programs (Attachment 1). It was understood that all programs existing on the date of passage of the Resolution were considered "established programs."
- The Resolution of September 20-21, 1973, delegating to the Director authority under section 14(b) of the NSF Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract or other arrangement (Attachment 2).

The Executive Committee

- The Resolution approved by the Board on July 19-20, 1968, as amended February 21-22, 1974, delegating authority to the Executive Committee to act for the Board between meetings in approving grants, contracts or other arrangements and authority to act between meetings "on other matters in those rare instances where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director." (Attachment 3)
- The Resolution of November 21-22, 1968, delegating to the Executive Committee the function of approving final decisions of the Director imposing sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964 (Attachment 4).
- The Resolution of September 20-21, 1973, delegating to the Executive Committee the authority under section 14(b) of the NSF Act to approve the holding by the Director, the Deputy Director, or any Assistant Director or any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract or other arrangement. (Attachment 2)

Two points should be noted with respect to the Resolution of July 19-20, 1968:

First, while the Resolution is not techically a delegation of the Board's authority to the Director, it has the general characteristics of a delegation, and because of this and the importance which the Resolution has with respect to the operations of the Foundation, it has been included in this memorandum and treated as a delegation.

Second, with respect to the Board's Resolutions since July 19-20, 1968, approving application to specific Foundation programs of the general authority of the July 1968 Resolution, the program Directorates were asked by the Office of the General Counsel to supply a list of 1) all outstanding programs which were in existence on July 20, 1968 (or which can trace their ancestry to programs in existence on that date), and 2) all outstanding programs to which the general authority of the Resolution has been applied since July 20, 1968. Such programs appear as Attachments 5 and 6, respectively.

In examining the various programs it was discovered that extension of the Board of the general authority of the July 20, 1968, Resolution to three programs which have been in existence for some time, the Solar Eclipse Program (AAEO), the Global Atmospheric Research Program (AAEO), and the Scientists and Engineers in Economic Development Program (STIA) could not be found. To correct this situation, it is recommended that the Board approve application to these programs of the general authority of the Resolution.

If after review and discussion of the attached delegations, the Board approves, I recommend that the following Resolution be adopted:

> The Board unanimously AFFIRMED the application to the programs set forth in Attachments 5 and 6/7 of NSB 76-165 of the Director's general authority to take final actions on grants, contracts, or other arrangements pursuant to the Resolution of July 19-20, 1968, as amended.
>
> Further, the Board unanimously AUTHORIZED the application to 1) the Global Atmospheric Research Program, 2) the Solar Eclipse Program, and 3) the Scientists and Engineers in Economic Development program of the Director's general authority to take final action on grants, contracts, or other arrangements, pursuant to the Resolution of July 19-20, 1968, as amended.

H. Guyford Stever
Director

Attachments

NSB-73-170

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD
AT ITS 119TH MEETING ON JULY 19-20, 1968
AS AMENDED AT ITS 123RD MEETING ON FEBRUARY 13-14, 1969

Authorization to the Director and the Executive Committee of the National Science Board To Review, Approve, and Take Final Action on Contracts, Grants, or Other Arrangements

The Board unanimously RESOLVED, that, in accordance with the provisions of Section 5(e) of the National Science Foundation Act, as amended, the Director of the National Science Foundation may make a contract, grant, or other arrangement, pursuant to Section 11(c) of the Act, as amended, without the prior approval of the Board, wherever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year, and the award is made pursuant to an established program of the Foundation;

RESOLVED, further, that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board shall act for the Board in those rare instances, including the approval of grants, contracts or other arrangements, where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director;

RESOLVED, further, that this resolution supersedes and replaces the resolution of the Board of September 11, 1964, on this subject (NSB-64-171), which shall henceforth be of no force or effect.

The Board unanimously AGREED that each resolution of the Board approving the commitment by the Director of a specific amount of funds by contract, grant or other arrangement shall, unless it specifically states otherwise, be deemed to include approval for the Director, at his discretion, to amend the instrument to commit additional sums, not to exceed 10 per cent of the amount specified, or to change the expiration date of the instrument.

June 18, 1973

ATTACHMENT I

Attachment 2 Page 1 of 2

2. Affiliations of Presidentially Appointed Staff

The General Counsel reminded the Board of its statutory obligation to approve certain outside affiliations of the Director, Deputy Director, and Assistant Directors. He distributed a current list (NSB-73-224) for the Board's consideration with two additions: Dr. Creutz--Chairman, Program Submission Review Subpanel on Multi-Directional Research, Atomic Energy Commission: and Dr. Eggers---Chairman, Program Submission Review Subpanel on Solar Energy Research, Atomic Energy Commission.

> The National Science Board CONSIDERED and unanimously APPROVED the outside affiliations of the Director, the Deputy Director, and the Assistant Directors as reported to the Board by the Director in NSB-73-224, as amended above, pursuant to the requirements of Section 14(b) of the National Science Foundation Act of 1950, as amended.

To avoid undue delay in acting on future invitations to the staff to serve in external advisory capacities, the General Counsel proposed and the Board agreed to the following resolutions (as set forth in NSB-73-238--distributed at the meeting):

> The National Science Board unanimously DELEGATED to the Chairman of the Board its authority under Section 14(b) of the National Science Foundation Act of 1950, as amended, to approve the holding by the Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement;
>
> Further, the Board unanimously DELEGATED to the Director its authority under Section 14(b) of the Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement under this Act;
>
> Further, the Board unanimously DELEGATED to the Executive Committee its authority under Section 14(b) of the Act to approve the holding by the Director, the Deputy Director, or any Assistant Director, of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act, provided, however, that the Director as a member of the Executive Committee shall not vote upon any matter regarding himself; and
>
> Finally, the Board unanimously REQUESTED that all such approvals granted under the above resolutions shall be reported at the next meeting of the Board.

Attachment 3 Page 1 of 1

d. Delegation of Authority to Executive Committee

In view of the present annual funding restrictions, the Board acted as follows on the recommendation of the General Counsel:

> The National Science Board unanimously AMENDED the second paragraph of the resolution approved by the Board on July 20, 1968, delegating certain authority to the Director and to the Executive Committee to read as follows:
>
> RESOLVED, further, that pursuant to Section 4(b) of the Act the Executive Committee of the National Science Board may act for the Board between meetings of the Board in approving grants, contracts, or other arrangements where such approval is required by the Act or other rules of the Board, and it may act for the Board between meetings of the Board on other matters in those rare instances where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director.

In taking the above action it was understood that: (1) any member of the Executive Committee may request that any proposal be referred to the entire Board for approval; (2) the Chairman of the Programs Committee will participate with the Executive Committee in such proposal review; (3) the Executive Committee will inform the Board at its next meeting of all approvals made on behalf of the Board pursuant to this delegation of authority; and (4) this delegation will be reconsidered if the annual funding restriction is lifted.

Attachment 4 Page 1 of 1

d. Civil Rights

The Board considered determinations regarding noncompliance with Title VI of the Civil Rights Act of 1964 (NSB-68-330—Members' Books, Tab C) and took the following action:

> The National Science Board unanimously APPROVED and ADOPTED as the final decision of the National Science Foundation the initial decision of the hearing officer finding noncompliance with Title VI of the Civil Rights Act of 1964 in the case of the South Panola Consolidated School District and the State Department of Education of Mississippi.

121:3

> Further, The Board unanimously DELEGATED to the Executive Committee its function of approving final decisions of the Director which impose sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964, as such function is described in the regulations of the Foundation (45 CFR 611.10 (e)).

121:4

Attachment 5 Page 1 of 2

The following are current programs which were in existence or which can trace their ancestry to a program which was in existence, at the time of the July 19-20, 1968 Resolution:

- Scientific Research Projects (MPE, BBS, AAEO)
  - * Behavioral Sciences
  - * Astronomical, Atmospheric, Earth and Ocean Sciences
  - * Biological Sciences
  - * Chemistry
  - * Computer Research
  - * Materiels Research
  - * Mathematics
  - * Physics
  - * Social Sciences
  - * Engineering
- Doctoral Dissertation Research (MPE, BBS, AAEO)
- Engineering Research Initiation Grants (MPE)
- International Travel Grants (all Directorates)
- Ocean Sediment Coring Program (AAEO)
- Oceanographic Facilities and Support (AAEO)
- U.S. Antarctic Research Program (AAEO)
- Science Information Activity (STIA) [originally, Science Information Service Program]
- International Cooperative Scientific Activities (STIA)
- Special Foreign Currency Programs (partial) (STIA)
- Studies of Science Resources Program (STIA) [This program traces origin to activities of the Office of Economic and Manpower Studies, in existence at the time of the July 1968 Resolution.]
- Public Understanding of Science (SE)
- Improvement of Pre-College Inst. (SE)
  - * Instructional Improvement
  - * Pre-Service Teacher Education

- Undergraduate Instructional Scientific Equipment (SE)

- Science Faculty Resources Development (SE)

  * Faculty Research Participation
  * College Faculty Short Courses
  * Faculty Oriented Improvement

- Fellowships (SE)

  * Graduate
  * National Needs

- Traineeships (SE)

  * National Needs
  * Minority Institutions

- Student-Oriented Programs (SE)

  * High School Student Training
  * Undergraduate Research Participation

- Pre-College Materials Development (SE)

  Testing and Evaluation

- Technological Innovation in Education (SE)

- Alternatives in Higher Education (SE)

Attachment 6 Page 1 of 2

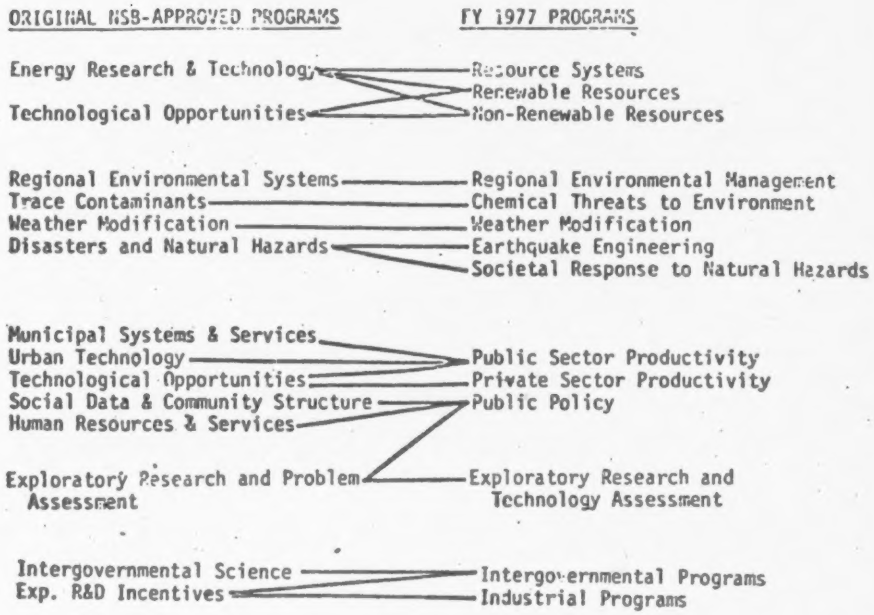
Programs Approved Since July 19-20, 1968 Resolution:

Programs as Approved by NSB	Present Program Title
- Climate Dynamics Program Oct. 1975, 176:4	Same (AAEO)
- International Decade of Ocean Exploration, April 1971, 138:10	Same (AAEO)
- Arctic Research Programs Mar. 1971, 137:9	Same (AAEO)
- Research Applied to National Needs (RANN)	See Attachment 7 for derivation from original NSB-approved programs
* Energy Research and Technology Nov. 1972, 151:4	
* Earthquake Engineering (Disasters and Natural Hazards) Nov. 1972, 151:4	
* Fire Research, Nov. 1972, 151:4	
* Weather Modification, Oct. 1972, 150:4	
* Trace Contaminants, Jan. 1973, 152:14	
* Regional Environmental Systems Jan. 1973, 152:14	
* Social Data and Community Structure Feb. 1973, 153:13-14	
* Human Resources and Services Feb. 1973, 153:13-14	
* Municipal Systems, Operations, and Services, Feb. 1973, 153:13-14	
* Urban Technology, Feb. 1973, 153:13-14	
RANN continued	See Attachment 7 for derivation from original NSB-approved programs
* Technological Opportunities Mar. 1973, 154:9	
* Exploratory Research & Problem Assessment, Mar. 1973, 154:9	
* Intergovernmental Science May 1970, 131:17	
- Special Foreign Currency Program for Scientific & Technological Information, April 1971, 138:9	Subelement of Special Foreign Currency Activity (STIA)

- Special Foreign Currency Program for Research, Science Education, and Related Activities, May 1971, 139:8-9	"
- College Science Improvement Program (So-called Predominantly Black Colleges) April 1971, 138:6	Minority Institutions Science Improvement (SE)
- Student-Originated Studies January 1971, 135:17	Same (SE)
- Comprehensive Assistance to Undergraduate Science Education (CAUSE) Program, Sept. 1975, 175:16	Same (SE)
- Research Initiation and Support (RIAS) Program, Oct. 1975, 176:9-10	Same (SE)

ATTACHMENT 7

DERIVATION OF FY 1977 PROGRAMS FROM NSB-APPROVED PROGRAMS



ORIGINAL NSB-APPROVED PROGRAMS	FY 1977 PROGRAMS
Energy Research & Technology	Resource Systems
	Renewable Resources
Technological Opportunities	Non-Renewable Resources
Regional Environmental Systems	Regional Environmental Management
Trace Contaminants	Chemical Threats to Environment
Weather Modification	Weather Modification
Disasters and Natural Hazards	Earthquake Engineering
	Societal Response to Natural Hazards
Municipal Systems & Services	
Urban Technology	Public Sector Productivity
Technological Opportunities	Private Sector Productivity
Social Data & Community Structure	Public Policy
Human Resources & Services	
Exploratory Research and Problem Assessment	Exploratory Research and Technology Assessment
Intergovernmental Science	Intergovernmental Programs
Exp. R&D Incentives	Industrial Programs

REVISED DELEGATION OF AUTHORITY PROCEDURE

Programs Committee--Forty-seventh Meeting--April 20-21

Dr. Harrison, Chairman, reported that the Committee discussed proposed actions for presentation to the Board, improving the efficiency of operation and the validity of oversight of the Committee, and NSB award approval criteria.

On the recommendation of the Committee (NSB/PC-77-12--distributed at the Board meeting), the Board approved a revised general delegation of authority to the Director and the Executive Committee regarding review, approval, and final action on grants, contracts, or other arrangements, as follows:

> The Board unanimously RESOLVED that:
>
> (1) The Director of the National Science Foundation, without the prior approval of the National Science Board, may make a grant, contract, or other arrangement whenever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year and the award is made within an established program of the Foundation previously approved by the Board.
>
> (2) Each standard grant, continuing grant, cooperative agreement, contract, or other arrangement (as defined in staff memorandum O/D 76-42, dated August 2, 1976) is to be considered separately and as a whole in determining whether the commitments involved exceed the $2,000,000 cumulative limit or the $500,000 annual limit. But, if simultaneous or successive awards are to be made for the same principal investigator based on only a single complete peer review or a single procurement, the simultaneous or successive awards shall be considered to constitute a single award in determining whether either limit is exceeded. Such successive awards based on a single complete peer review or a single procurement are to be considered as involving a total commitment of more than $2,000,000 as soon as program staff anticipates that the total ultimately committed is likely to exceed $2,000,000.
>
> (3) The Executive Committee of the National Science Board may approve grants, contracts, or other arrangements where Board approval is

required, or otherwise act for the Board in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director.

(4) When the National Science Board approves the commitment by the Director of a specific amount of funds by grant, contract, or other arrangement, unless the Board specifically states otherwise, the Director may at his discretion subsequently amend the instrument to commit additional sums, not to exceed 10 percent of the amount specified, or to change the expiration date of the instrument.

(5) This resolution supersedes and replaces the resolutions of the Board on this subject adopted in July 1968 and amended in February 1969 and February 1974.

189:20-21

NSB-78-211

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

nsf
OFFICE OF THE DIRECTOR

May 11, 1978

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

SUBJECT: Biennial Review of Delegations of Authority to Director and/or Executive Committee

In May 1976 the Board reviewed and approved all current delegations of authority it had made to the Director and the Executive Committee. The Chairman suggested that this review be biennial and made at the Annual meeting in the even-numbered years.

The following delegations of authority are in effect:

Director

- Resolution of April 21-22, 1977, authorizing the Director to review, approve, and take final action on contracts, grants, or other arrangements under established programs (Attachment 1).
- Resolution of September 20-21, 1973, delegating to the Director authority under section 14(b) of the NSF Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal with which the Foundation makes any grant, contract, or other arrangement; and subsequent reporting to the Board at its next meeting. (Attachment 2).

Executive Committee

- Resolution of April 21-22, 1977, delegating authority to the Executive Committee to act for the Board between meetings in approving grants, contracts or other arrangements, and authority to act for the Board ". . . in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director." (Attachment 1)

- Resolution of November 21-22, 1968, delegating to the Executive Committee the function of imposing sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964 (Attachment 3).

- Resolution of September 20-21, 1973, delegating to the Executive Committee the authority under Section 14(b) of the NSF Act to approve the holding by the Director, the Deputy Director, or any Assistant Director of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement; and subsequent reporting to the Board at its next meeting. (Attachment 2).

With respect to the Resolution of April 21-22, 1977, you should note that while the Resolution is not technically a delegation of the Board's authority to the Director, it has the general characteristics of a delegation, and, because of this and the importance which the Resolution has with respect to the operations of the Foundation, it has been included in this memorandum and treated as a delegation.

In May 1976, the Board approved a list of programs covered by the Director's general authority to review, approve, and take final action on grants, contracts and other arrangements. (NSB 76-165). Program directorates and offices were asked by OGC to update this list to delete programs no longer in existence and to add programs approved by the Board since the 1976 Resolution and programs that have changed in name but can trace back to the programs covered by the May 1976 Resolution. This updated list appears as Attachment 4.

If after review and discussion of the attached delegations, the Board approves, I recommend that the following resolution be adopted:

> The National Science Board AFFIRMS the outstanding delegations of authority to the Director and the Executive Committee as set forth in attachments 1, 2, and 3 of NSB-78-217.

- Resolution of November 21-22, 1968, delegating to the Executive Committee the function of imposing sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964 (Attachment 3).

- Resolution of September 20-21, 1973, delegating to the Executive Committee the authority under Section 14(b) of the NSF Act to approve the holding by the Director, the Deputy Director, or any Assistant Director of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement; and subsequent reporting to the Board at its next meeting. (Attachment 2).

With respect to the Resolution of April 21-22, 1977, you should note that while the Resolution is not technically a delegation of the Board's authority to the Director, it has the general characteristics of a delegation, and, because of this and the importance which the Resolution has with respect to the operations of the Foundation, it has been included in this memorandum and treated as a delegation.

In May 1976, the Board approved a list of programs covered by the Director's general authority to review, approve, and take final action on grants, contracts and other arrangements. (NSB 76-165). Program directorates and offices were asked by OGC to update this list to delete programs no longer in existence and to add programs approved by the Board since the 1976 Resolution and programs that have changed in name but can trace back to the programs covered by the May 1976 Resolution. This updated list appears as Attachment 4.

If after review and discussion of the attached delegations, the Board approves, I recommend that the following resolution be adopted:

> The National Science Board AFFIRMS the outstanding delegations of authority to the Director and the Executive Committee as set forth in attachments 1, 2, and 3 of NSB-78-217.
>
> Further, the National Science Board also AFFIRMS the application to the programs set forth in Attachment 4 of NSB-78-217 of the Director's general authority to take final action on grants, contracts, or other arrangements pursuant to the Resolution of April 21-22, 1977.

Richard Atkinson
Richard C. Atkinson
Director

Attachments
Attachment 1: Resolution of April 21-22, 1977
Attachment 2: Resolution of September 21-22, 1973
Attachment 3: Resolution of November 21-22, 1968
Attachment 4: List of current NSF Programs

NSB-77-245

Attachment 1

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 189TH MEETING ON APRIL 21-22, 1977

Authorization to the Director and the Executive Committee of the National Science Board To Review, Approve, and Take Final Action on Grants, Contracts, or Other Arrangements

The Board unanimously RESOLVED that:

(1) The Director of the National Science Foundation, without the prior approval of the National Science Board, may make a grant, contract, or other arrangement whenever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year and the award is made within an established program of the Foundation previously approved by the Board.

(2) Each standard grant, continuing grant, cooperative agreement, contract, or other arrangement (as defined in staff memorandum O/D 76-42, dated August 2, 1976) is to be considered separately and as a whole in determining whether the commitments involved exceed the $2,000,000 cumulative limit or the $500,000 annual limit. But, if simultaneous or successive awards are to be made for the same principal investigator based on only a single complete peer review or a single procurement, the simultaneous or successive awards shall be considered to constitute a single award in determining whether either limit is exceeded. Such successive awards based on a single complete peer review or a single procurement are to be considered as involving a total commitment of more than $2,000,000 as soon as program staff anticipates that the total ultimately committed is likely to exceed $2,000,000.

(3) The Executive Committee of the National Science Board may approve grants, contracts, or other arrangements where Board approval is required, or otherwise act for the Board in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director.

(4) When the National Science Board approves the commitment by the Director of a specific amount of funds by grant, contract, or other arrangement, unless the Board specifically states otherwise, the Director may at his discretion subsequently amend the instrument to commit additional sums, not to exceed 10 percent of the amount specified, or to change the expiration date of the instrument.

(5) This resolution supersedes and replaces the resolutions of the Board on this subject adopted in July 1968 and amended in February 1969 and February 1974.

May 17, 1977

Attachment 2

To avoid undue delay in acting on future invitations to the staff to serve in external advisory capacities, the General Counsel proposed and the Board agreed to the following resolutions (as set forth in NSB-73-238--distributed at the meeting):

> The National Science Board unanimously DELEGATED to the Chairman of the Board its authority under Section 14(b) of the National Science Foundation Act of 1950, as amended, to approve the holding by the Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement;
>
> Further, the Board unanimously DELEGATED to the Director its authority under Section 14(b) of the Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement under this Act;

> Further, the Board unanimously DELEGATED to the Executive Committee its authority under Section 14(b) of the Act to approve the holding by the Director, the Deputy Director, or any Assistant Director, of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act, provided, however, that the Director as a member of the Executive Committee shall not vote upon any matter regarding himself; and
>
> Finally, the Board unanimously REQUESTED that all such approvals granted under the above resolutions shall be reported at the next meeting of the Board.

ES:158:4-5

Excerpt from the Minutes of the Executive Session of the September 1973 NSB Meeting

Attachment 3

d. Civil Rights

The Board considered determinations regarding noncompliance with Title VI of the Civil Rights Act of 1964 (NSB-68-300--Members' Books, Tab C) and took the following action:

> Further, The Board unanimously DELEGATED to the Executive Committee its function of approving final decisions of the Director which impose sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964, as such function is described in the regulations of the Foundation (45 CFR 611.10 (e)).

121:3-4

Excerpt from the Minutes of the November 1968 NSB Meeting

Attachment 4

The following list includes current programs which existed or can trace their ancestry to a program which existed at the time of the May 1976 Resolution. It also includes programs approved after May 1976 (the month and year of approval are given in parenthesis following the title).

1. All Directorates: International Travel Grants

2. Basic Research Directorates: (MPE, BBS, AAEO)

- Scientific Research Project Support
  - * Mathematics
  - * Computer Research
  - * Physics
  - * Chemistry
  - * Material Research
  - * Engineering
  - * Astronomical, Atmospheric, Earth and Ocean Sciences
  - * Biological Sciences
  - * Behavioral Sciences
  - * Social Sciences
- Doctoral Dissertation Research (MPE, BBS, AAEO)
- Climate Dynamics Program (AAEO)
- Engineering Research Initiation Grants (MPE)
- International Decade of Ocean Exploration (AAEO)
- Ocean Sediment Coring Program (AAEO)
- Global Atmosphere Research Program (AAEO)
- Oceanographic Facilities and Support (AAEO)
- Weather Modification (AAEO) (Transferred from RANN/ASRA in 1977)
- Arctic Research Programs (AAEO)
- U.S. Antarctic Research Program (AAEO)

3. STIA Directorate:

- Science Information Activity
- International Cooperative Scientific Activities
- Scientists and Engineers in Economic Development
- Special Foreign Currency Programs
- Policy Research and Analysis Program (Technology Assessment Program transferred from RANN/ASRA in 1977)
- Studies of Science Resources Program

4. Science Education Directorate:

- Fellowships and Traineeships
  - *Graduate Fellowships
  - *Minority Graduate Fellowships (Jan. 1978)
  - *Minority Inst. Grad. Traineeships
  - *National Needs Postdoc. Fellowships
  - *National Needs Grad. Traineeships
- Student-Oriented Programs
  - *Secondary School Student Training
  - *Student-Oriented Studies
  - *Undergraduate Research Participation
- Faculty Improvement
  - *Pre-College Teacher Development (Nov. 1976)
  - *College Faculty Short Courses
  - *Science Faculty Professional Development
- Minorities and Women in Science

- Comprehensive Assistance to Undergraduate Science Education
- Undergraduate Instructional Improvement
  *Instructional Scientific Equipment
  *Local Course Improvement
- Minority Institutions Science Improvement
- Resource Center for Science and Engineering (Nov. 1977)
- Research Initiation And Support (No funding in FY 1978)
- Information Dissemination for Science Education
- Research in Science Education (Nov. 1976)
- Development in Science Education
- Public Understanding of Science
- Ethics and Values in Science and Technology
- Science for Citizens (Feb. 1977)

5. ASRA Directorate:

- Community Water Management
- Chemical Threats to Man and the Environment
- Earthquake Hazards Mitigation
- Alternative Biological Sources of Materials
- Applied Physical, Mathematical, and Biological Sciences and Engineering
- Applied Social and Behavioral Sciences
- Problem Analysis
- Intergovernmental Program
- Industrial Program
- Integrated Basic Research

NSB-80-198

NATIONAL SCIENCE FOUNDATION
WASHINGTON D.C. 20550

nsf

OFFICE OF THE
DIRECTOR

May 8, 1980

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

SUBJECT: Biennial Review of Delegations of Authority to Director and/or Executive Committee

In May 1976 and again in May 1978 the National Science Board reviewed and approved all current delegations of authority it had made to the Director and the Executive Committee pursuant to Section 4(b) of the National Science Foundation Act of 1950, as amended. The Chairman suggested that this review be biennial and made at the annual meeting in the even-numbered years.

The following delegations of authority are in effect:

Director

- Authorizing the Director to review, approve, and take final action on contracts, grants, or other arrangements under established programs whenever such award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year. (Attachment 1)
- Authorizing the Director, following Board approval of an award for a specified amount, to increase the amount of the award by no more than 10 percent or to change the expiration date of the award. (Attachment 1)
- Authorizing the Director to approve the holding by the Deputy Director or any Assistant Director of any office in, or acting in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement, as required by Section 14(b) of the NSF Act, and subsequent reporting to the Board at its next meeting. (Attachment 2)

Executive Committee

- Authorizing the Executive Committee to act for the Board between meetings (1) in approving grants, contracts or other arrangements where Board approval is necessary, and (2) "...in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director." (Attachment 1)
- Authorizing the Executive Committee under Section 14(b) of the NSF Act to approve the holding by the Director, the Deputy Director, or any Assistant Director of any office in, or acting in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement; and subsequent reporting to the Board at its next meeting. (Attachment 2)

- Authorizing the Executive Committee to approve final decisions of the Director that impose sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964. (Attachment 3)

The resolution included in Attachment 1 is not technically a delegation of the Board's authority to the Director, but it has the general characteristics of a delegation. Because of this and the importance of the resolution to the operations of the Foundation, it has been included in this memorandum and treated as a delegation.

In May 1976 and May 1978 the Board approved a list of programs covered by the Director's general authority to review, approve, and take final action on grants, contracts and other arrangements. (See NSB 76-165 and NSB 78-217.) Program directorates and offices were asked by the Office of the General Counsel to update this list to delete programs no longer in existence and to add programs approved by the Board since the 1978 resolution and programs that have changed in name but can be traced back to the programs covered by the May 1978 resolution. This updated list appears as Attachment 4.

If after review and discussion of the attached delegations the Board approves, I recommend that the following resolution be adopted:

> The National Science Board AFFIRMS the outstanding delegations of authority to the Director and the Executive Committee as set forth in Attachments 1, 2, and 3 of NSB-80-166; further, the National Science Board also AFFIRMS the application to the programs listed in Attachment 4 of NSB-80-166 of the Director's general authority to take final action on grants, contracts, or other arrangements under the resolution of April 21-22, 1977.

Richard Atkinson
Richard C. Atkinson
Director

Attachments:
  Attachment 1, Resolution of April 21-22, 1977
  Attachment 2, Resolution of September 21-22, 1973
  Attachment 3, Resolution of November 21-22, 1968
  Attachment 4, List of current NSF Programs

NSB-77-245

Attachment 1

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 189TH MEETING ON APRIL 21-22, 1977

Authorization to the Director and the Executive Committee of the National Science Board To Review, Approve, and Take Final Action on Grants, Contracts, or Other Arrangements

The Board unanimously RESOLVED that:

(1) The Director of the National Science Foundation, without the prior approval of the National Science Board, may make a grant, contract, or other arrangement whenever such an award involves a total commitment of less than $2,000,000 or less than $500,000 in any one year and the award is made within an established program of the Foundation previously approved by the Board.

(2) Each standard grant, continuing grant, cooperative agreement, contract, or other arrangement (as defined in staff memorandum O/D 76-42, dated August 2, 1976) is to be considered separately and as a whole in determining whether the commitments involved exceed the $2,000,000 cumulative limit or the $500,000 annual limit. But, if simultaneous or successive awards are to be made for the same principal investigator based on only a single complete peer review or a single procurement, the simultaneous or successive awards shall be considered to constitute a single award in determining whether either limit is exceeded. Such successive awards based on a single complete peer review or a single procurement are to be considered as involving a total commitment of more than $2,000,000 as soon as program staff anticipates that the total ultimately committed is likely to exceed $2,000,000.

(3) The Executive Committee of the National Science Board may approve grants, contracts, or other arrangements where Board approval is required, or otherwise act for the Board in those rare instances when immediate decision is required between Board meetings and when the necessary action is not within the authority of the Director.

(4) When the National Science Board approves the commitment by the Director of a specific amount of funds by grant, contract, or other arrangement, unless the Board specifically states otherwise, the Director may at his discretion subsequently amend the instrument to commit additional sums, not to exceed 10 percent of the amount specified, or to change the expiration date of the instrument.

(5) This resolution supersedes and replaces the resolutions of the Board on this subject adopted in July 1968 and amended in February 1969 and February 1974.

May 17, 1977

Attachment 2

To avoid undue delay in acting on future invitations to the staff to serve in external advisory capacities, the General Counsel proposed and the Board agreed to the following resolutions (as set forth in NSB-73-238--distributed at the meeting):

The National Science Board unanimously DELEGATED to the Chairman of the Board its authority under Section 14(b) of the National Science Foundation Act of 1950, as amended, to approve the holding by the Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement;

Further, the Board unanimously DELEGATED to the Director its authority under Section 14(b) of the Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract, or other arrangement under this Act;

Further, the Board unanimously DELEGATED to the Executive Committee its authority under Section 14(b) of the Act to approve the holding by the Director, the Deputy Director, or any Assistant Director, of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act, provided, however, that the Director as a member of the Executive Committee shall not vote upon any matter regarding himself; and

Finally, the Board unanimously REQUESTED that all such approvals granted under the above resolutions shall be reported at the next meeting of the Board.

ES:158:4-5

Excerpt from the Minutes of the Executive
Session of the September 1973 NSB Meeting

Attachment 3

d. Civil Rights

The Board considered determinations regarding noncompliance with Title VI of the Civil Rights Act of 1964 (NSB-68-300--Members' Books, Tab C) and took the following action:

Further, The Board unanimously DELEGATED to the Executive Committee its function of approving final decisions of the Director which impose sanctions upon primary and secondary schools pursuant to Title VI of the Civil Rights Act of 1964, as such function is described in the regulations of the Foundation (45 CFR 611.10 (e)).

121:3-4

Excerpt from the Minutes of the November
1968 NSB Meeting

Attachment 4

The following list includes current programs which existed or can trace their ancestry to a program which existed at the time of the May 1978 Resolution. It also includes programs approved after May 1978 (the month and year of approval are given in parenthesis following the title).

1. Directorate for Astronomical, Atmospheric, Earth and Ocean Sciences
   - Astronomical, Atmospheric, Earth and Ocean Science scientific research project support
   - Doctoral Dissertation Research Improvement
   - Climate Dynamics Program
   - Deep Sea Drilling Program
   - Global Atmosphere Research Program
   - Oceanographic Facilities and Support
   - Arctic Research Programs
   - U.S. Antarctic Research Program
2. Directorate for Biological, Behavioral, and Social Sciences
   - Scientific Research Project Support for:
     * Biological Sciences
     * Behavioral Sciences
     * Social and Economic Sciences
   - Doctoral Dissertation Research Improvement
3. Directorate for Mathematical and Physical Sciences
   - Scientific Research Project Support for:
     * Mathematics
     * Computer Research
     * Physics
     * Chemistry
     * Material Research
   - Research Initiation Grants (DMR)
   - Mathematical Sciences Research Fellowship Program (approved by NSB in Nov. 1978 on a two-year trial basis; authorization expires in Nov. 1980)
   - Doctoral Dissertation Research Improvement (current policy precludes awards)
4. Directorate for Engineering and Applied Science
   - Scientific Research Project Support for Engineering
   - Doctoral Dissertation Research Improvement (current policy precludes awards in engineering)
   - Research Initiation Grants (Engineering)

- Earthquake Hazards Mitigation
- Alternative Biological Sources of Materials
- Applied Physical, Mathematical, and Biological Sciences and Engineering
- Applied Social and Behavioral Sciences
- Research Initiation Grants (Applied Social and Behavioral Sciences) (September 1979)
- Problem Analysis
- Intergovernmental Program
- Small Business Innovation and Industrial Technology (derived from ASRA Industrial Program)
- Integrated Basic Research
- Human Nutrition Program (Nov. 1978)
- Science and Technology Aid to the Handicapped (Nov. 1978)
- Experimental Program to Stimulate Competitive Research (Jan. 1978)
- Appropriate Technology (Jan. 1980)

5. Directorate for Scientific, Technological, and International Affairs

- Information Science & Technology Programs
- International Cooperative Scientific Activities
- Science in Developing Countries
- Special Foreign Currency Programs
- International Travel Support
- Policy Research and Analysis Program
- Studies of Science Resources Program

6. Directorate for Science Education

- Fellowships and Traineeships
    * Graduate Fellowships
    * Minority Graduate Fellowships
    * Minority Institutions Graduate Traineeships
    * Postdoctoral Fellowships
- Student-Oriented Programs
    * Secondary School Student Training
    * Student-Originated Studies
    * Undergraduate Research Participation
- Faculty Improvement
    * Pre-College Teacher Development
    * College Faculty Short Courses
    * Science Faculty Professional Development
- Minorities and Women in Science
- Physically Handicapped in Science (March 1979)

- Comprehensive Assistance to Undergraduate Science Education
- Undergraduate Instructional Improvement
    - * Instructional Scientific Equipment
    - * Local Course Improvement
- Minority Institutions Science Improvement
- Resource Centers for Science and Engineering
- Information Dissemination for Science Education
- Research in Science Education
- Development in Science Education
- Public Understanding of Science
- Ethics and Values in Science and Technology
- Science for Citizens
- Public Service Science Centers (Jan. 1980)

7. Cross Directorate/Special Projects

- Industry/University Cooperative Research
- Research Initiation in Minority Institutions

NSB PROCEDURES

APPENDIX A
NSB-64-133
(Revised)

PARTICIPATION OF NATIONAL SCIENCE BOARD MEMBERS IN NSF PROJECTS

Resolution Adopted by the National Science Board at its Fifty-fifth Meeting on September 16-17, 1958, as Amended at its Sixty-seventh Meeting on September 8-9, 1960, and at its Ninety-fifth Meeting on June 18-19, 1964

The National Science Foundation Act of 1950, as amended, provides that the National Science Board shall be composed of persons who "(1) shall be eminent in the fields of the basic sciences, medical science, engineering, agriculture, education or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the view of scientific leaders in all areas of the Nation." The interests of science require a maximum contribution from the leaders in each field. Therefore, Board Members should not disqualify themselves from participation in projects supported by the National Science Foundation merely because of Board membership.

However, Board Members should be alert to avoid any action which could possibly be interpreted as a use of Board membership to further their own interests or those of an institution with which they are affiliated.

The application of these two basic principles may be illustrated by the following examples:

(1) A Board Member should not submit an application for Foundation funds on behalf of himself or an institution which employs him, or with which he is affiliated, nor should he participate in any way in support of such an application. All negotiations between an institution and the Foundation should be carried on by persons who are not Board Members.

(2) A Board Member should refrain from any negotiations with the Foundation; therefore, one should not be named as a "Principal Investigator" since, by Foundation regulations, a "Principal Investigator" must sign a proposal coming from an institution. A proposal should clearly indicate the nature of the participation of the Board Member in the project but a person, other than the Board Member, who is familiar with the scientific aspects of the project, should be named "Principal Investigator."

(3)A Board Member may take part in projects undertaken with support from the Foundation but should not personally receive any remuneration out of Foundation funds for his services to a project where the proposal specified his participation or was submitted in the knowledge of his intended participation, or to a project supported through an institution with which he has an academic, administrative or policy responsibility.

(4) A Board Member should leave the room during the discussion and determination of a proposal from an institution with which he is affiliated.

The considerations and procedures set forth above also govern, where applicable, relations between the Foundation and former Board Members for one year following termination of their services on the Board.

NSB-68-77
March 20, 1968

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD
(from the Director)

MATTERS RELATING TO THE HOLDING AND CONDUCT OF THE OFFICE OF MEMBERS OF THE NATIONAL SCIENCE BOARD, INCLUDING CONFLICTS-OF-INTEREST AND POLITICAL ACTIVITIES

From time to time the Board has adopted Resolutions and this Office has issued memoranda dealing with various subjects relating to the holding and conduct of the office to which Board Members have been appointed.

This memorandum is intended to bring these several matters together in one up-to-date document. It is hoped that it will serve as a general compendium which will be of use to Members from the time of their first appointment and thereafter, including a one-year period after their having ceased to hold office. The sections on political activities will be especially pertinent in this year of a national election.

I. Conflicts-of-Interest and Related Matters
  A. Federal Conflicts-of-Interest Statutes
  B. Dual Federal Compensation and Employment
  C. Participation in Foundation Projects
  D. Executive Order on Conflicts-of-Interest and the Filing of Financial Statements
  E. Public Statements
II. Political Activities and Related Matters
  A. Hatch Act -- Political Activities
  B. Other Statutes Concerning Political Activities
  C. Endorsement of Candidates and Political Contributions
III. Appendix: Statutes and Board Resolutions

I. Conflicts of Interest and Related Matters

A. Federal Conflicts-of-Interest Statutes (Bribery, Graft, and Conflicts of Interest)

These statutes are found at 18 U.S.C. 201-218 (see Appendix). Membership on the Board may be considered as constituting one a "special government employee" under this statute, i.e., they serve for not to exceed 130 days during any period of 365 days.

A summary of the most significant provisions from the point of view of Board Members follows:

> Title 18, U.S.C., Section 203 prohibits government employees from receiving compensation for services rendered for others before a Federal department or agency in connection with matters in which the United States is a party or is interested. Section 203 applies to a "special government employee" only in relation to (1) a particular matter in which such employee has participated personally or substantially

in his governmental capacity or (2) which is pending in the agency in which he is serving. If he serves in the particular agency no more than sixty days during the preceding three hundred and sixty-five days, he is not barred with respect to pending matters. Furthermore, if the Director of the Foundation certifies in writing in the Federal Register that the national interest requires it, a special government employee may legally act as agent or attorney for another person in the performance of work under a grant by, or a contract with, the United States.

Title 18, U.S.C., Section 205 prohibits an officer or employee of the United States from acting as agent or attorney for prosecuting any claim against the United States, whether for compensation or not, and from receiving any gratuity or any interest in any such claim in consideration of its prosecution. Section 205 also precludes an officer or employee of the Government from acting as agent or attorney for anyone before a department, agency or court in connection with any particular matter in which the United States is a party or has a direct or substantial interest. The exceptions for special government employees cited above in connection with Section 203 also apply to Section 205. As in the case of Section 203, certification as to the national interest requirements in the case of particular special government employees may also be made by the Director under this section.

Title 18, U.S.C., Section 207 permanently bars a former government employee, including a special government employee, from acting as agent for anyone in connection with any matter in which the United States is a party and in which he participated personally and substantially in his governmental capacity. A former employee is also barred for one year from appearing as agent or attorney in connection with matters which were in the area of his official responsibility when employed by the Government. The restrictions of Section 207 can be waived in connection with a former employee with outstanding scientific or technological qualifications if the Director certifies in writing in the Federal Register that such waiver is in the national interest.

Title 18, U.S.C., Section 208 bars an officer or employee of the Government, including a special government employee, from participating as such in any matter in which, to his knowledge, he, his spouse, minor child, partner, or organization in which he serves as an employee or officer, has a financial interest. The bar also extends to a matter in which an organization with whom he is negotiating or has an arrangement concerning employment has a financial interest. The Director of the Foundation may grant a particular employee an exemption from the effects of this section if the outside financial interests in a matter are deemed not substantial enough to have an effect on the integrity of his services.

Title 18, U.S.C., Section 209 bars an officer or employee of the Government, other than special government employees or persons serving the Government without compensation, from receiving, and anyone from paying him, any salary or supplementation thereof from a private source as compensation for his services as an officer or employee of the Government. An officer or employee covered by this section, however, may continue his participation in a bona fide pension plan or other employee welfare or benefit plan maintained by a former employer; he may also accept contributions, awards or other expenses under the terms of the Government Employees Training Act.

B. Dual Federal Compensation and Employment

5 U.S.C. 5533 provides that, in general, civilian personnel shall not be entitled to receive basic compensation from more than one government civilian position (office) for more than an aggregate of forty hours of work in any one calendar week.

This provision does not apply to "compensation on a when-actually employed basis received from more than one consultant or expert position if such compensation is not received for the same hours of the same day."

However, a Board Member who is a retired officer of any regular component of the uniformed services might be liable to have his retirement pay reduced through serving in a civilian federal office. If such a situation should arise, the particular facts should be considered.

C. Participation of National Science Board Members in NSF Projects

The National Science Board at its ninety-fifth meeting on June 18-19, 1964, adopted the following Resolution:

> "The National Science Foundation Act of 1950, as amended, provides that the National Science Board shall be composed of persons who '(1) shall be eminent in the fields of the basic sciences, medical science, engineering, agriculture, education or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the view of scientific leaders in all areas of the Nation.' The interests of science require a maximum contribution from the leaders in each field. Therefore, Board Members should not disqualify themselves from participation in projects supported by the National Science Foundation merely because of Board membership.
>
> "However, Board Members should be alert to avoid any action which could possibly be interpreted as a use of Board membership to further their own interests or those of an institution with which they are affiliated.
>
> "The application of these two basic principles may be illustrated by the following examples:
>
> > "(1) A Board Member should not submit an application for Foundation funds on behalf of himself or an institution which employs him, or with which he is affiliated, nor should he participate in any way in support of such an application. All negotiations between an institution and the Foundation should be carried on by persons who are not Board Members.
> >
> > "(2) A Board Member should refrain from any negotiations with the Foundation; therefore, one should not be named as a "Principal Investigator' since, by Foundation regulations, a 'Principal Investigator' must sign a proposal coming from an institution. A Proposal should clearly indicate the nature of the participation of the Board Member in the project but a person,

other than the Board Member, who is familiar with the scientific aspects of the project, should be named 'Principal Investigator.'

"(3) A Board Member may take part in projects undertaken with support from the Foundation but should not personally receive any remuneration out of Foundation funds for his services to a project where the proposal specified his participation or was submitted in the knowledge of his intended participation, or to a project supported through an instituion with which he has an academic, administrative or policy responsibility.

"(4) A Board Member should leave the room during the discussion and determination of a proposal from an institution with which he is affiliated.

"The considerations and procedures set forth above also govern, where applicable, relations between the Foundation and former Board Members for one year following termination of their services on the Board."

D. Executive Order on Conflicts-of-Interest and the Filing of Financial Statements

That part of Executive Order 11222, issued May 8, 1965, (30 F.R. 6469) which covers special Government Employees reads as follows:

"Sec. 302. A consultant, adviser, or other special Government employee must refrain from any use of his public office which is motivated by, or gives the appearance of being motivated by, the desire for private gain for himself or other persons, including particularly those with whom he has family, business, or financial ties.

"Sec. 303. A consultant, adviser, or other special Government employee shall not use any inside information obtained as a result of his government service for private personal gain, either by direct action on his part or by counsel, recommendations or suggestions to others, including particularly those with whom he has family, business, or financial ties.

"Sec. 304. An adviser, consultant, or other special Government employee shall not use his position in any way to coerce, or give the appearance of coercing, another person to provide any financial benefit to him or persons with whom he has family, business, or financial ties.

"Sec. 305. An adviser, consultant, or other special Government employee shall not receive or solicit from persons having business with his agency anything of value as a gift, gratuity, loan or favor for himself or persons with whom he has family, business, or financial ties while employed by the government or in connection with his work with the government.

"Sec. 306. Each agency shall, at the time of employment of a consultant, adviser, or other special Government employee require him to supply it with a statement of all other employment. The statement shall list the names of all the corporations, companies, firms, State or local government organizations, research organizations and educational or other institutions in which he is serving as employee, officer, member, owner, director,

> trustee, adviser, or consultant. In addition, it shall list such other financial information as the appointing department or agency shall decide is relevant in the light of the duties the appointee is to perform. The appointee may, but need not, be required to reveal precise amounts of investments. The statement shall be kept current throughout the period during which the employee is on the Government rolls."

In my opinion this Order applies to Members of the Board, who are to be considered "special Government employees." In view of the nature of the Board's responsibilities, it is of great importance for members to file statements of employment with the Board Secretary. However, you will note that the third sentence in Section 306 refers to such financial information as the appointing department or agency shall decide is relevant. Since Board Members are Presidential appointees they are covered by a regulation issued by the President dated June 17, 1966 (31 F.R. 8556) which states that Members of Boards need file financial statements with the Chairman of the Civil Service Commission only when so requested by the Counsel to the President. Since no such request has been made, financial statements, technically, are not required. Nevertheless, the spirit of the Executive Order could be fully satisfied and possible criticism avoided by voluntarily filing such statements with the Secretary of the Board. In this connection it should be noted that at its 95th Meeting, June 18-19, 1964, the Board decided that the filing of financial statements with the Board Secretary should be left to the discretion of the individual Board Members, who will assume personal responsibility for avoiding any possible conflict of interest and for otherwise adhering to the provisions of the President's Memorandum of May 2, 1963, [which has been superseded by Executive Order 11222] and the applicable statutes.

"(b) An employee or individual to whom subsection (a) of this section applies retains the right to vote as he chooses and to express his opinion on political subjects and candidates. (5 U.S.C. 7324(a), (b))."

The exemption of Board Members from this statute is based upon the following provision:

> "(d) Subsection (a)(2) of this section does not apply to--
>
> > (3) an employee appointed by the President, by and with the advice and consent of the Senate, who determines policies to be pursued by the United States in its relations with foreign powers or in the nationwide administration of Federal laws."

(5 U.S.C. 7324(d)(3)).

The maximum penalty for violation of the Hatch Act is removal from office.

E. Public Statements

(1) It is important that Board Members be mindful of their responsibility as members of the Executive Branch of the Government, in making public statements relating to the Foundation and recognize that such statements may affect policies established by the President and relationships between the Executive and Legislative Branches of the Government.

(2) Since Board Members, individually, may be regarded by the public as representing the Foundation, statements concerning the Foundation should, as far as possible, represent Foundation policy as agreed upon. Where a statement not reflecting Foundation policy is made, care should be taken to clearly identify it as individual opinion not necessarily reflecting any official position.

(3) Matters such as a proposed budget, recommended legislation, approval of grants, or other pending activities in which carrying into effect decisions of the Board requires further action by the Director or some other part or branch of the Government must, of necessity, be held in confidence pending public release.

(4) Copies of public statements, printed articles, and the like, in which Board Members comment on matters concerning the activities of the Foundation should be furnished to the Executive Secretary whenever practicable for circulation among the Board and staff and for reference purposes.

II. Political Activities and Related Matters

From time to time inquiries are received from Board Members as to whether a particular form of political action is permissible under Federal law. The purpose of this section is to set forth the general laws and regulations governing political activities of Board Members. As the laws on this subject have been the subject of insufficient litigation to establish definite rulings in many particular cases, it is recommended that, if any particular situation arises, specific advice be sought from the General Counsel or a private lawyer.

A. Hatch Act -- Political Activities

Board Members are, in my opinion, exempt from the provisions of the Hatch Act (5 U.S.C. 7321-7327) which provides the major restriction on political activities of Federal officers and employees. The basic prohibition of the Hatch Act is as follows:

> "(a) An employee in an Executive agency or an individual employed by the government of the District of Columbia may not -
>
> (1) use his official authority or influence for the purpose of interfering with or affecting the result of an election; or
>
> (2) take an active part in political management or in political campaigns.
>
> "For the purpose of this subsection, the phrase "an active part in political management or in political campaigns" means those acts of political management or political campaigning which were prohibited on the part of employees in the competitive service before July 19, 1940, by determinations of the Civil Service Commission under the rules prescribed by the President.

B. Other Statutes Concerning Political Activity to Which Board Members are Subject

(1) Holding State or Local Office

Since Board Members are not subject to the Hatch Act restrictions on political activity, the only restriction imposed by Federal statute or Executive Order on their holding a State or local office is one which provides that the appropriate Federal agency must determine in advance that the holding of the office by a part-time officer will not interfere with the regular and efficient discharge of his Federal duties. (21 Federal Register 10365)

(2) Political Solicitation, Coercion or Discrimination

A number of criminal statutes preclude Federal officers and employees, including members of the National Science Board, from participation in certain political activities. The most significant of these are: 18 U.S.C. 602, 603, 604, and 607 which prohibit the soliciting or receiving of political contributions from other Federal employees or from any person on Federal relief, or in a Federal building, or delivering a political contribution to another Federal employee.

Other statutes prohibit the use of official authority to interfere with or coerce the vote or political activity of any person or body, or to interfere with or affect the nomination or election of any Federal officer (18 U.S.C. 594, 595, 598) and prohibit affecting the employment status of any Federal employee on account of political contributions, or affecting the employment of any person on Federal relief on account of race, creed, color or political activity. (18 U.S.C. 61(c), 601, 606)

(3) Purchase or Sale of Public Office

Solicitation, payment or receipt of money for procurement of a Federal office, or promise of Federal office as a reward for political activity, are prohibited. (18 U.S.C. 210, 211, 600)

C.. Comments on Particular Questions: Endorsement of Candidates and Political Contributions

The following comments may be of general interest:

(1) May a Board Member publicly endorse the candidacy of a person running for office, as by placing the Member's name on the letterhead of a political group promoting the candidacy?

Since the Hatch Act is not applicable to Board Members, there is no reason why any provisions of that Act should interfere with Members participating in or managing a political campaign. However, as noted above, 18 U.S.C. 602,which prohibits all Federal officers and employees from directly or indirectly soliciting any political contribution from another Federal officer or employee, reads as follows:

> "Whoever, being a Senator or Representative in, or Delegate or Resident Commissioner to, or a candidate for Congress, or individual elected as, Senator, Representative, Delegate, or Resident Commissioner, or an officer or employee of the United States or any department or agency thereof, or a person receiving any salary or compensation for services from money derived from the Treasury of the United States, directly or indirectly solicits, receives, or is in any manner concerned in soliciting or receiving, any assessment, subscription, or contribution for any political purpose whatever, from any other such officer, employee, or person, shall be fined not more than $5,000 or imprisoned not more than three years or both."

Hence, a Board Member's name should not appear on any fund-raising request, either directly or as a member of a committee, where the request might reasonably be expected to result in a Federal employee, or other person described in the statute, being requested to contribute for a particular candidacy or political action.

In view of the above, if a Board Member wishes to join an organization such as the "Scientists and Engineers for ______" I would advise that he state in his acceptance letter that his name is not to be used in any way to solicit funds from Federal officers or employees, from any person on Federal relief, from any person receiving any salary or compensation for services from money derived from the Treasury of the United States, or from anyone in a building or room occupied for Government purposes.

(2) May a Board Member make a contribution to a Congressman seeking re-election?

18 U.S.C. 607 provides as follows:

> "Making Political Contributions.
> Whoever, being an officer, clerk, or other person in the service of the United States or any department or agency thereof, directly or indirectly gives or hands over to any other officer, clerk, or person in the service of the United States, or to any Senator or Member of or Delegate to Congress, or Resident Commissioner, any money or other valuable thing on account of or to be applied to the promotion of any political object, shall be fined not more than $5,000 or imprisoned not more than three years, or both." June 25, 1948, ch.645, 62 Stat. 722.

While the language of this section might be construed to proscribe any contribution of money to any person or Committee promoting a Congressman's candidacy, it has generally been considered proper, within the Executive Branch, for government employees to contribute to "regularly constituted political organizations." Thus Pamphlet 20 of the U. S. Civil Service Commission, dated November 1961, contains a summary of laws governing political activity of government employees. While the pamphlet disclaims any authority beyond that of furnishing legal reference, at page 12 it states that:

> "Employees may make voluntary contributions to a regularly constituted political organization for its general expenditures, subject to the limitation laid down in Section 608, Title 18, U.S. Code. . . ."

The Commission has held that voluntary contributions may be made at any time, even subsequent to a general election, so long as they are made to a regularly constituted political organization for its general expenditures.

However, there is also carried on page 12 the following disclaimer:

> "In addition, certain sections of the Criminal Code place restrictions on contributions by Federal employees. . . . These sections of the Criminal Code are within the jurisdiction of the Department of Justice, and the law provides severe penalties for violations." /Section 607 is one of those sections referred to/

William J. Hoff
William J. Hoff
General Counsel

APPENDIX

(These applicable documents are available on request.)

1. 18 U.S.C. 301-313
2. Public Law 33-443
3. Resolution adopted by the National Science Board at its 95th Meeting, June 18-19, 1964.
4. President's Memorandum of May 2, 1963.

ATTENDANCE OF THE PUBLIC AT OPEN BOARD MEETINGS

Excerpt from the Executive Session Minutes of the 144th of the National Science Board--January 20-21, 1972

Discussion and Action Items

The Chairman presented a statement prepared by the General Counsel and approved by the Executive Committee outlining the future policy of the National Science Board on outside attendance at open Board meetings (NSB-72-4). The statement requires all individuals and representatives of organizations requesting to attend and/or participate in any meeting of the Board to make such a request in writing to be referred to the Director for recommendation prior to forwarding to the Board for action. The statement also provides for immediate adjournment of the Board, subject to recall by the Chairman, if uninvited and unauthorized persons attempt to observe, participate in, or disrupt its meetings.

The Board unanimously APPROVED the statement outlining policy of the National Science Board on outside attendance at open Board meetings (attached as Appendix A only to record copy of these minutes in the Board Office).

The Chairman said he would welcome suggestions from Board Members regarding groups who should be invited to meet with the Board from time to time.

ES:144:4-5

STANDING COMMITTEES

The Ad Hoc Nominating Committee for Board Officers, after deliberating on the important role of the Executive Committee, the responsibilities of the Programs and Planning and Policy Committees, recommended that the chairmen of these two standing committees be invited to attend meetings of the Executive Committee to assure complete communication among these important bodies of the Board.

> The Board unanimously ACCEPTED the recommendation of the Ad Hoc Nominating Committee for Board Officers and URGED the Chairmen of the Programs and Planning and Policy Committees to attend all Executive Committee meetings.

In taking this action, the Board agreed that the Executive Committee should continue to serve as in the past in an advisory capacity for the Board and should not assume larger policy responsibilities for the Board.

The Chairman reminded the Board that all Members are welcome at all times to attend meetings of the Executive Committee.

The Chairman reported that the Executive Committee recommended the continuation of the three Board standing committees--Budget, Programs, and Planning and Policy--with their present assigned missions and membership. The Board concurred in this recommendation.

The membership of the Programs and Planning and Policy Committees will be reconsidered at the September Board meeting after the appointment of new Board Members.

The Chairman expressed the hope that the Planning and Policy Committee in the future would address itself to a greater degree to policy issues, especially those pertaining to long range plans.

Members were requested to indicate on which of the two principal standing committees they would like to serve.

To utilize more effectively the limited time and diversified talents of the Board, the Chairman reported that the Executive Committee recommended revamping the present three-day Board meeting schedule as follows:

Wednesday--4:00-8:00 p.m., including dinner--Executive Committee
Thursday--9:00 a.m.-1:00 p.m.--NSB Executive Session
Thursday afternoon and evening--standing and ad hoc committees
Friday--9:00 a.m.-3:00 p.m.--NSB Open Session.

The Committee also proposed that Thursday evening social functions not be regular events but be held from time to time, especially for occasions such as attendance of new Board Members or advisory committee visitors. The Board accepted the above proposals, to become effective in September.

CONFLICTS OF INTEREST

Upon the recommendation of the General Counsel, it was agreed that the Board should consider proposals individually and that during discussions and votes any Board Member associated with a recipient institution or organization should absent himself from the meeting and refrain from voting. It was pointed out, however, that a Board Member holding a nonadministrative position with a university was only very remotely connected to an organization in which the university might hold membership and consequently if inconvenient need not always absent himself but, in no event, should he participate in the discussion or vote.

ES:148:28

USE OF FORMAL RESOLUTIONS

The Director encouraged the Board, when it felt strongly on any subject, to adopt formal resolutions to convey clearly its directions to the staff.

ES:152:7

NSB CONGRESSIONAL STATEMENTS

The General Counsel circulated NSB/EC-72-25 (distributed at the 72-9 Meeting) and a memorandum for Mr. Wilfred H. Rommel (Assistant Director for Legislative Reference, OMB) from Mr. Dwight A. Ink (Assistant Director, OMB) regarding clearance of congressional statements by Board Members. The General Counsel reported that OMB views the National Science Board as subject to its Circular A-19 requiring that Board Members' testimony on pending legislation (other than appropriation requests) be submitted to OMB. The Committee agreed that, after this matter is reported to the Board, the General Counsel should confirm this understanding on behalf of the Board with OMB and that Board Members would be guided accordingly.

ES:154:12

APPENDIX A

NSB-72-4
LIMITED DISTRIBUTION
January 5, 1972

STATEMENT OF THE NATIONAL SCIENCE BOARD [REGARDING THE PUBLIC'S ATTENDANCE AT BOARD MEETINGS]

IT IS THE SENSE OF THE BOARD, That all individuals and representatives of organizations requesting to attend and/or participate in any meeting of the National Science Board shall make such a request in writing setting forth in as great detail as possible the nature and purpose of the request, the subject matter to be discussed, and all other relevant facts. Such persons shall first be referred to the Director (or a person delegated by him for such purposes) who shall thereafter report to the Board, or its Executive Committee, all such requests together with his recommendations, if any, as to whether such a requested appearance should be invited, and on what terms. In making his recommendations, the Director shall be guided by the following:

(1) The Board will not discuss topics of a specific nature, dealing with specific persons, institutions, applications, grants or contracts, or other matters of such nature;

(2) The subject matter of any meeting with the Board shall be limited to matters of general application and mutual importance to the Board and the scientific community in general;

(3) The subject matter must be of such a nature so that its discussion would assist the Board in carrying out its duties and responsibilities under the National Science Foundation Act of 1950, as amended.

IT IS THE FURTHER SENSE OF THE BOARD, That the Board shall immediately adjourn, subject to recall by the Chairman, if uninvited and unauthorized persons attempt to observe, participate in, or disrupt its meetings.

PROPOSAL EVALUATION BY BOARD MEMBERS

The Director read a letter from Dr. Charpie dated May 11 calling attention to recent requests to him from NSF staff members to review proposals. The Committee agreed with the Director and Dr. Charpie that such referrals to Board Members are inappropriate. The Director read a draft memorandum to staff members requesting them not to make such requests of Board Members in the future unless the Director specifically approves such a referral based on exceptional circumstances.

June 7, 1973
O/D 73-15

USE OF NSB MEMBERS AS PROPOSAL REVIEWERS

It has come to my attention that some Members of the National Science Board have been requested by program directors to review proposals pending in the National Science Foundation. I believe this practice to be unwise since it may limit Members of the Board from commenting or participating in a discussion on the proposal's merits should it come before the Board. Moreover, whether a proposal comes before the Board or not, I believe that Members of the National Science Board should not be requested to comment on or review proposals before the Foundation since their individual opinions could be given, or appear to be given, special weight because of their membership on the Board--whereas responsibility rests with the Board as an institution.

Consequently, no proposals should hereafter be sent to Members of the National Science Board for comment or review without the specific approval of the Director. Approval will be given only upon a clear showing of special extraordinary circumstances.

H. Guyford Stever
Director

Distribution F

APPENDIX B

RESOLUTION REGARDING CONFLICTS OF INTEREST AND NATIONAL SCIENCE BOARD MEMBER AFFILIATIONS

The National Science Board unanimously RESOLVED that:

1. The following and comparable relationships constitute affiliations of such closeness that a Board Member should leave the room during discussion and determination of a matter involving an institution or organization with which such a relationship exists:

a. A financial interest in an organization such as receipt of compensation for services as a full-time or part-time employee of the institution or organization itself, as a member of a policy-making or advisory body thereof, or as a consultant or continuing lecturer. Compensation would include not only receipt of salary, fees, grants, or honoraria, but also other things, benefits, or services of monetary value.

b. Nonfinancial interests:

(1) Being an officer or a member of the board of directors, regents, or trustees, or a similar policy-making body of an institution, association, or other organization though serving without compensation or even reimbursement for expenses;

(2) Holding an appointment as adjunct professor, or a similar appointment conferring official status in an organization even though unpaid by that organization;

(3) Membership on a committee or other subordinate operating or advisory group would also constitute a close affiliation with respect to any matter which fell within the jurisdiction of that committee or group.

2. Intermediate situations in which a Board Member need not leave the room but should be recorded as not voting include membership on a committee or other subordinate operating or advisory body of an organization where the matter before the Board was not related to the jurisdiction of the committee; for example, membership on a university visiting committee to a particular department when the matter before the Board involves the university but has no relation to the particular department.

3. Board Members should feel free to participate in decisions affecting institutions with which the following and comparable relationships exist:

a. Receipt of travel expenses only for nonrepetitive participation in symposia or panel discussions;

b. Membership on the faculty of a university which is a member of a consortium participating in the management of a national center or laboratory, such as the Associated Universities, Incorporated, or the Northeast Radio Observatory Corporation, provided that the Board Member has no connection with the center and is not a member of a policy-making body of the university; and

c. Serving as consultant or member of an advisory body to another Government agency.

September 20, 1973

NSB MEMBERS AS CONGRESSIONAL WITNESSES

Programs Committee--Twenty-second Meeting--February 21 and 22

Dr. Hackerman, Chairman, reported that the Committee: (a) reviewed and recommended approval by the Board at this meeting of 12 proposals and actions and considered the Research Management Improvement and Experimental PhD Incentives Programs (as reported in detail in the Open Session Minutes); (b) discussed Board procedures after approving a program (once a program is approved, whether the Board has the right to act beyond the discussion of individual proposals and projects thereunder); and (c) discussed the role of Board Members appearing as congressional witnesses (if asked Board position, Member should report his understanding of the formal posture of the Board as accurately as possible; if asked for personal views, Member could so state, making it clear that he is speaking as an individual).

ES:162:5

NSB CONFLICTS OF INTEREST

The General Counsel reviewed present procedures relating to Board Members' activities designed to avoid any conflicts of interest in the heading and conducting of their offices. The General Counsel supplemented the 1968 Board document (NSB-68-77) with specific guidance concerning obstinence of Board Members from discussions and decisions on matters involving institutions or organizations with which they have some type of affiliation (NSB-68-226--Members' Books, Tab C).

After a brief discussion, the Board acted as follows:

> The Board unanimously ADOPTED the supplemental resolution to NSB-68-77 establishing guidelines for Board Members' actions attached as Appendix B.

Members were requested to keep the Board Office fully informed of the precise nature of all current affiliations and changes thereto.

ES:158:3

APPENDIX B

RESOLUTION REGARDING CONFLICTS OF INTEREST AND NATIONAL SCIENCE BOARD MEMBER AFFILIATIONS

The National Science Board unanimously RESOLVED that:

1. The following and comparable relationships constitute affiliations of such closeness that a Board Member should leave the room during discussion and determination of a matter involving an institution or organization with which such a relationship exists:

a. A financial interest in an organization such as receipt of compensation for services as a full-time or part-time employee of the institution or organization itself, as a member of a policy-making or advisory body thereof, or as a consultant or continuing lecturer. Compensation would include not only receipt of salary, fees, grants, or honoraria, but also other things, benefits, or services of monetary value.

b. Nonfinancial interests:

(1) Being an officer or a member of the board of directors, regents, or trustees, or a similar policy-making body of an institution, association, or other organization though serving without compensation or even reimbursement for expenses;

(2) Holding an appointment as adjunct professor, or a similar appointment conferring official status in an organization even though unpaid by that organization;

(3) Membership on a committee or other subordinate operating or advisory group would also constitute a close affiliation with respect to any matter which fell within the jurisdiction of that committee or group.

2. Intermediate situations in which a Board Member need not leave the room but should be recorded as not voting include membership on a committee or other subordinate operating or advisory body of an organization where the matter before the Board was not related to the jurisdiction of the committee; for example. membership on a university visiting committee to a particular department when the matter before the Board involves the university but has no relation to the particular department.

3. Board Members should feel free to participate in decisions affecting institutions with which the following and comparable relationships exist:

a. Receipt of travel expenses only for nonrepetitive participation in symposia or panel discussions:

b. Membership on the faculty of a university which is a member of a consortium participating in the management of a national center or laboratory, such as the Associated Universities, Incorporated, or the Northeast Radio Observatory Corporation, provided that the Board Member has no connection with the center and is not a member of a policy-making body of the university; and

c. Serving as consultant or member of an advisory body to another Government agency.

September 20, 1973

ES:158:16-17

BOARD RELATIONSHIP TO ADVISORY COMMITTEES

On recommendation of the Executive Committee, the Board will continue its present relationship with advisory groups. Board Members were again encouraged to attend those advisory committee meetings for which they have been assigned responsibility.

ES:163:5

The Committee discussed how the Board might participate more fully and at an earlier stage in the consideration of and take more formal actions on major issues. A mechanism now exists through the Planning and Policy Committee to identify for the Board such items of interest.

It was agreed that the Board through the Planning and Policy Committee should be more sensitive to identifying important issues and that the Board should act in an appropriate manner depending on the nature of the activity and the issue. Board input of program ideas should be separated from the budget cycle. The Board Chairman will direct the Policy Agenda Subcommittee to be more alert to bringing to the Board for discussion items of current or potential importance and urgency. The Director should continue to bring to the Board major program issues needing Board consideration.

ES:163:16

AMENDMENTS TO NSF ACT

The General Counsel presented a proposed bill to amend the National Science Foundation Act of 1950, as amended (NSB/EC-74-13--distributed at the meeting).

Sections 3, 4, and 5 of the proposed bill regarding the Board were suggested by the Board Chairman. Proposed Sections 2 (Trust Fund) and 6 (delegation to the Director) were previously presented to the Committee in principle and approved by the Board. Proposed Section 7 is partly technical editing of the NSF Act and partly a Tydings type amendment to provide that appropriations will be available for obligation for two years instead of one year. This portion of Section 7 was suggested by the Minority Staff Director of the Senate Committee on Labor and Public Welfare. Proposed Section 8, which moves the Science Information Service into the basic Act, was also suggested by him in order to clean up the body of statutes on education rather than to improve the NSF Act. Actually it does both.

The General Counsel stated that the proposed statutory changes will be placed in priority order.

The Executive Committee recommended that the Director present the statutory changes outlined in the proposed bill to the Office of Management and Budget and the appropriate congressional committees.[1]

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[1] An additional amendment was proposed following the meeting which would provide that Board Members remain in office until their successors are sworn in as Members. The Board Chairman endorsed this additional amendment.

ES:164:27

FREEDOM OF INFORMATION ACT

The General Counsel called to the Board's attention his memorandum (NSB-75-71) summarizing the Freedom of Information Act amendments and the recently published NSF regulations implementing them. Following the Board's review of this material, the General Counsel requested Board approval in NSB-75-103 (distributed at the meeting).

The Board took the following action:

> The National Science Board, having REVIEWED the National Science Foundation Freedom of Information Act Regulations as published in the March 21, 1975, Federal Register (40 F.R. 12793-12796), FOUND them to be in accordance with previously established National Science Board policies.

Dr. Cobb abstained from voting on the above resolution.

172:9

Office of the General Counsel)

Memorandum to Members of the National Science Board

NSB-73-226
September 11, 1973

(Limited Distribution)

CONFLICTS OF INTERESTS AND NSB MEMBER AFFILIATIONS

At the 156th meeting of the National Science Board (May 1973) the Chairman requested the General Counsel to update his March 20, 1968, Memorandum to the Board, entitled "Matters relating to the Holding and Conduct of the Office of Member of the National Science Board, Including Conflicts of Interests and Political Activities" (NSB-68-77).

I have carefully reviewed the laws and regulations relating to conflicts of interest and find that they have not changed. Consequently, I believe that the Memorandum of March 20, 1968 continues accurately to reflect the relevant laws and regulations. A copy is attached for your review.

However, upon review of the rules governing participation of NSB members in the discussion and decision of matters involving institutions or organizations with which they are affiliated, it appears that certain portions might be supplemented to provide specific guidance concerning abstinence by Board members from such discussions and decisions. Section I.C. of Mr. Hoff's 1968 Memorandum sets forth a Resolution which was adopted by the Board at its 95th meeting on June 18-19, 1964. That Resolution states:

> ". . . Board members should be alert to avoid any action which could possibly be interpreted as use of Board membership to further their own interests or those of an institution with which they are affiliated.

> "(1) A Board member should not submit an application for Foundation funds on behalf of himself or an institution which employs him or with which he is affiliated nor should he participate in any way in support of such an application.
>
> . . .
>
> "(4) A Board member should leave the room during the discussion and determination of a proposal from an institution with which he is affiliated."

Of course, a Board member should not submit an application for Foundation funds on behalf of any one nor engage in any negotiations with the Foundation. With respect to participation in decisions of the Board, which obviously may include support of an application, the key is interpretation of the word "affiliated". It is clear that some affiliations with an institution or organization are at most tenuous or transient. It should be possible to distinguish between those "affiliations" which involve real or apparent conflicts of interest under the laws and regulations on conflicts of interests and those which are so remote as to exert no influence on the Board member involved. It may also be possible to define intermediate circumstances in which actual influence would not exist although the appearance of possible influence might be present. Here a Board member might participate in discussion but refrain from voting. Suggested for your consideration is the following resolution, which interprets the word "affiliated" and sets forth guidelines as to when a Board member should absent himself during discussion and decision of matters.

RESOLVED That, (1) The following and comparable relationships constitute affiliations of such closeness that a Board member should leave the room during discussion and determination of a matter involving an institution or organization with which such a relationship exists:

(a) A financial interest in an organization such as receipt of compensation for services as a full-time or part-time employee of the institution or organization itself, as a member of a policy making or advisory body thereof, or as a consultant or lecturer.

Compensation would include not only receipt of salary, fees, grants or honoraria, but also other things, benefits or services of monetary value.

(b) Non-financial interests: (i) Being an officer or a member of the Board of Directors, Regents or Trustees, or a similar policy-making body of an institution, association or other organization though serving without compensation or even reimbursement for expenses. (ii) Holding an appointment as adjunct professor, or a similar appointment conferring official status in an organization even though unpaid by that organization. (iii) Membership on a committee or other subordinate operating or advisory group would also constitute a close affiliation with respect to any matter which fell within the jurisdiction of that committee or group.

(2) Intermediate situations in which a Board member need not leave the room but should be recorded as not voting include membership on a committee or other subordinate operating or advisory body of an organization where the matter before the Board was not related to the jurisdiction of the committee, for example, membership on a university visiting committee to a particular department when the matter before the Board involves the university but has no relation to the particular department.

(3) Board members should feel free to participate in decisions affecting institutions with which the following and comparable relationships exist (a) receipt of travel expenses only for non-repetitive participation in symposia or panel discussions, (b) membership on the faculty of a university which is a member of a consortium participating in the management of a national center or laboratory such as AUI or NEROC provided that the Board member has no connection with the center and is not a member of a policy-making body of the university, and (c) serving as consultant or member of an advisory body to another government agency.

Charles F. Brown
Charles F. Brown
General Counsel

NSB OPERATION AND RESPONSIBILITY

Regarding its operation and responsibilities, the Board accepted the recommendations of Task Force 75-A and decided that:

(1) Board activities should be moved more towards policy concerns and increased effectiveness of its oversight responsibilities;

(2) The Board should undertake a more active external role on science policy issues and strengthen its linkages with external bodies; and

(3) The Board should undertake a study of possible mechanisms to increase the efficiency of its activities in order to accomplish the objectives in (1) and (2) above.

175:24

APPENDIX C

REPORT OF TASK FORCE 76-A ON NSB/NSF LONG-RANGE PLANNING AS APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 182ND MEETING

JUNE 18, 1976

Issue 76-A

Task Force 76-A addressed the question: How should the policy formulation obligation of the National Science Board be linked with the long-range planning procedures of the National Science Foundation?

Summary of Actions and Recommendations of Task Force 76-A

1. The Task Force considered to be a good idea a staff suggestion for an annual Planning Environment Document (PED). The Task Force recommends six action items to the Board:

   a. The Board should establish and annually update a Planning Environment Document.

   b. The Board should restructure its June meeting to allow for thorough review of the PED and adoption of policy/information guidelines based on this review for action on the fall long-range planning estimates (LRPE) as well as other special analyses.

   c. The Planning and Policy Committee should take responsibility for working with the staff in preparing and presenting the PED at the June Board meeting.

   d. The Committee on Budget should consider reexamining priority considerations, based on the results of the June Board meeting, with immediate priorities integrated into the summer and fall budget preparation and with deferred program priorities integrated into the fall preparation of the LRPE.

   e. An opportunity should be provided during the June Board meeting for the Planning and Policy Committee and the Committee on Budget to meet jointly to review the results of the Board discussion of and actions/guidelines on the PED.

   f. The Programs Committee should consider scheduling its reviews to provide timely information on the status of programs for input to the discussion of the PED at the June Board meeting.

2. In order to provide further guidance to the staff, a more detailed presentation of the structure and type of information to be included in the PED will be developed as an addendum to this report.

3. More deliberate involvement and interaction are desirable between the staff and the Planning and Policy Committee in the preparation of the PED. Such exchanges might be facilitated by a spring retreat involving staff and members of the Planning and Policy Committee.

4. With regard to the responsibility of the National Science Board for formulating and implementing policy, the Task Force recommends that:

   a. The directorates provide the Planning and Policy Committee with a list of the significant policies under which they operate, indicating those having clear NSB guidance and those for which they would like NSB clarification and policy guidance;

b. These lists be reviewed by the Planning and Policy Committee and, where further guidance is required, submitted to the Board with recommendations for action;

c. The Planning and Policy Committee be charged with developing a list of broader policy concerns, such as those identified in "The National Science Foundation--Board and Director" (NSB-76-199, prepared by Mr. William J. Hoff, former NSF General Counsel), for possible NSB comment and action;

d. The results of these activities and NSB actions be appropriately listed and indexed in a Policy Compendium for periodic review and updating by the National Science Board.

182:21-22

RESEARCH BY NSB MEMBERS

Ad Hoc Committee on NSB Research Support (NSB-77-113--Members' Books, Tab N)

The Board Chairman introduced Dr. Harvey Picker (Member of the Board from 1965 to 1970 and Chairman, Ad Hoc Committee on NSB Research Support) and two members of the Committee, Dr. Thieme (Board Member from 1964 to 1976) and Mr. William J. Hoff (NSF General Counsel from 1953 to 1973). The report of this Committee (NSB-77-113) contained an amendment to the resolution adopted by the Board at its Fifty-fifth Meeting on September 16-17, 1958, as amended at its Sixty-seventh Meeting on September 8-9, 1960, and its Ninety-fifth Meeting on June 18-19, 1964 (NSB-64-133, Revised).

The Committee agreed that it is in the national interest to permit eminent scientists to continue to make contributions to scientific knowledge by acting as principal investigators of research projects, and, at the same time, to utilize their knowledge and judgment while serving as Members of the National Science Board. The Committee regarded it as an undesirable waste of a valuable human resource to require that such persons be removed either from leading research investigations or from assisting the Nation to formulate policies in regard to science.

The Committee therefore recommended that the resolution contained in NSB-64-133, Revised be modified to permit Board Members to be principal investigators of projects funded by the National Science Foundation under a selection system such as described below.

The Committee recognized that the method used to approve proposals for Board Members must, in so far as possible, meet two criteria:

(a) The approval process must be such that the decision to fund or reject the project shall be made by those of scientific capability who will judge it in relation to other similar NSF projects, but who are under no direct or indirect influence of the scientist as a Member of the Board. The process must be subject to especially careful scrutiny so that the Board, the scientist, and the public are protected.

(b) The approval process should be as similar as possible to that used for any other application for funding.

After discussing a wide variety of suggestions, the Committee recommended the following procedure:

(a) Applications to NSF in which a Board Member is to be the principal investigator shall minimize the role of the staff of the Foundation in its processing.

(b) There shall be no verbal discussion of the proposal between the Board Member and the NSF staff either before or after submission of the proposal. Correspondence to clarify technical details should be permitted and filed.

(c) Upon receipt of the proposal, the appropriate person on the staff would automatically submit it to the pertinent advisory panel for consideration. Requests for clarification and all replies should be in writing. All discussions would be on the public record.

If there be no advisory panel the normal evaluation by mail procedure would be used. The reviewers would be asked to determine whether in their opinion the funding level is appropriate. Again those queried would vote to fund or not fund the proposal.

(d) The staff may not fund any proposal submitted by a Board Member as principal investigator unless the appropriate panel has approved, nor may the Board Member/staff member discuss the project with the panelists other than to answer queries that are technically required. The program officer may also at his discretion fund the project at a lower level than approved by the panel, or he may turn the proposal down if he believes the requested funding level is too high. Further, he must put his reasons for action in writing.

(e) Before a Board Member may actually receive a grant as a principal investigator he shall sign a disclaimer (such as the amended version distributed at the Board meeting of the disclaimer attached as Appendix E to NSB-77-113) stating that he shall not obtain any personal remuneration from NSF funds for his services, that he has not discussed directly or indirectly with NSF staff the proposal, and that he has not in any way utilized his position as a Board Member to influence the decision to fund the proposal.

(f) A board or committee appointed by the National Science Board shall review annually all grants made by the Foundation in the past year to principal investigators who are Members of the Board. The members of the Board Approval Review Board (BARB) shall not be Board Members or staff members. They shall serve overlapping terms, one third of the membership being open for appointment or reappointment each year. The review of grants made by BARB shall be made public. Its purpose shall be to ascertain that all aspects of the review approval procedure have been scrupulously followed in such a way as to prevent any reasonable doubt that the resultant grant was made without undue influence and that it meets all appropriate criteria.

It was recommended that the foregoing procedures be used not only for an original grant but for any modification (other than one that is patently trivial) to the grant. It should also be used for grants held by a Member prior to his or her appointment to the National Science Board.

The Committee recommended that the foregoing procedures be utilized not only during a Board Member's term of office but also for one year after expiration of the term.

Following discussion it was moved and seconded that the Board accept and implement the report of the Ad Hoc Committee on NSB Research Support.

The motion was rejected.

Dr. Atkinson, Dr. Cooke, Mr. Doan, Dr. Hueg, Dr. O'Neal, Dr. Rice, and Dr. Slichter voted in favor of the motion.

Dr. Bisplinghoff, Dr. Campbell, Dr. Koshland, Dr. Mac Lane, Dean Meckling, Dr. Murray, Dr. Nierenberg, Dr. Reynolds, Dr. Rich, and Dr. Zumberge voted against adoption of the report.

Dr. Hogness was not present during the voting.

The Board Chairman discharged with appreciation the Ad Hoc Committee composed of Dr. Picker, Chairman, Dr. Hahn, Dr. O'Neal, Dr. Thieme, Mr. Herz, and Mr. Hoff.

188:28-30

NSB-78-266
June 12, 1978

RELEASE OF INFORMATION UNDER FREEDOM OF INFORMATION ACT

Under the Freedom of Information Act (FOIA), all documents and correspondence of the Board and its committees may be requested. The following information summarizes FOIA requirements as they apply to the Board.

A. Scope of Requests

"Documents" include all documents, numbered, unnumbered, final, draft, privileged and "limited distribution," that are sent to or come before the Board or its committees in open or closed session. "Correspondence" includes letters, memoranda, and any other written communications between:

NSB Members and
- NSB and/or other NSB Members
- NSB staff, including executive secretaries of NSB committees
- NSF staff
- all other persons, organizations, etc., when concerned with NSB business;

NSB staff and
- NSB and/or Members
- all other persons, organizations, etc.

NSF staff and
- NSB and/or Members
- all other persons, organizations, etc., when concerned with NSB business.

The Government in the Sunshine regulations of the Board require that a transcript or recording be made of each closed portion of a Board meeting or of an Executive Committee meeting when acting on behalf of the Board. These transcripts or recordings are subject to the same FOIA requirements as documents.

B. Exemptions

It is possible to withhold any portion of a document which falls under one of the exemptions listed below, but note the statement, "The Government should not withhold documents unless it is important to the public interest to do so, even if there is some arguable legal basis for the withholding."1/ The exemptions most commonly applicable to NSB/NSF documents are: 2/

Exemption 2--information relating solely to internal personnel rules and practices;
Exemption 4--information received in confidence--research proposals prior to award;
Exemption 5--inter- and intra-agency documents if not available, by law, to a private party in litigation with NSF. Examples include records involving the deliberative policymaking process of the Foundation such as future budgets or draft position papers; or proposed grants, contracts, or task orders on which the Board has acted but the award is not yet completed. Purely factual information, however, must always be released even if other parts of the documents are withheld;
Exemption 6--to protect the rights of privacy of individuals against "unwarranted" invasion.

C. Appeals

When a decision is made to withhold a document, letter, or other record, there may be an appeal. Also, with time, some information withheld earlier inevitably becomes available because of its character, such as documentation and discussion of proposed grants, contracts, or task orders after award; consideration of plans or proposed budgets, and documents containing information relevant to a particular decision, including early draft statements of that decision, position, resolution, etc.

1/Source: Letter to Heads of All Federal Departments and Agencies, Re: Freedom of Information Act, from Attorney General Griffin B. Bell (May 1977).

2/Source: NSF Circular No. 120 (Rev. 1), subject, Compliance with Requirements of the Freedom of Information Act (FOIA).

D. Time Frame
The law and NSF regulations require that information requested under FOIA be provided within 10 working days. A 10 day extension may be taken if the material is voluminous or coordination with other agencies or personnel outside Washington is required.

The Office of the General Counsel is always consulted in handling FOIA requests.

When a letter to or from or of direct concern to a Member is released, a copy and notice of its release will be furnished to that Member following release.

Norman Hackerman
Chairman

cc: Executive Secretaries of NSB Committees

NSB-78-266:1-2

ETHICS IN GOVERNMENT ACT

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

January 22, 1979

The Honorable Jimmy Carter
The President
The White House
Washington, D. C. 20500

My dear Mr. President:

We are writing to bring to your attention potentially unfortunate effects of the Ethics in Government Act of 1978 on the relationship between the Federal Government and the academic, scientific, and technological communities. The National Science Board strongly supports the objectives of that Act. However, the Board is seriously concerned that its public disclosure provisions will be a serious deterrent in recruiting scientists, educators, and engineers to serve as officials of or advisers to the Executive Branch.

As you know, this Act requires the Federal Government to disclose upon request financial and employment details of Presidential appointees and their immediate families. Such disclosures might well encourage financial solicitations, at the minimum, and the possibilities of kidnap, extortion, or other threats to these persons and their families. Post-employment restrictions are another aspect of the Act which will have an adverse effect on the useful exchange of talent between the Government and the scientific and technological communities.

As a result of these two provisions, many individuals of high quality with unique skills might now be unwilling to serve. This would lessen the optimal use of science and technology to improve the quality of life of our citizens.

So that the Federal Government can continue to benefit maximally from the wealth of talent in the academic and scientific communities, we believe it is in your best interest, Mr. President, to seek a liberal interpretation or some Congressional reexamination and relaxation of the public disclosure provisions in the Ethics in Government Act. Such action would be particularly appropriate for Presidential appointees who serve a relatively small number of days annually and often at considerable personal sacrifice.

A number of Members of the National Science Board have expressed serious concern about the possible side effects of this Act. One Board nominee may withdraw his name from consideration. Other potential Presidential appointees to this Board or to other similar bodies may also find it unduly invasive and may therefore decline to serve. Applying the full force of this Act to persons who wish to share their specialized talents with the Federal Government on an intermittent basis is most unfortunate.

In the case of the National Science Board the present clearance procedures are quite adequate to meet the intent of the Ethics in Government Act to "preserve and promote the integrity of public officials and institutions." No objections are raised to the disclosure of financial data to duly constituted bodies responsible for ascertaining conflicts, but Members of the Board object to the massive and indiscriminate public exposure of their personal finances.

Whereas our particular concern is for those who serve part-time, this Act obviously also has serious ramifications in the overall effort of the Federal Government for attracting quality scientists and engineers to full-time service.

We would appreciate an early opportunity to discuss this subject with you or someone you might designate to explore whether there are steps that can be taken to ensure that the highest quality of scientific advice will continue to be available to the Government at all times.

Respectfully yours,

Norman Hackerman
Chairman

EC: 79-1:9-10.

FUNDING FOR NSB SUPPORT SERVICES AT MEMBERS' HOME INSTITUTIONS

Proposed Regulations Exempting Board Members from Certain Financial Conflict of Interests

The General Counsel explained the existence of technical difficulties associated with the conflict of interests laws when support services are required for Board Members performin major Board or Foundation functions at their home institutions Mr. Herz proposed a blanket waiver to amend the regulations on Standards of Conduct for Employees and publishing the amended regulation in the Federal Register for public comment (NSB-78-389--Members' Books, Tab H).

After much discussion and several editorial changes to the amendment, the Board acted as follows:

NSB/Res-78-120 The Board unanimously APPROVED the publication in the Federal Register for public comment by February 1, 1979, of a proposed amendment to NSF regulations on standards of conduct for employees adding a general exemption from the operation of Section 208(a) of Title 18, U.S. Code, for certain financial interests arising from contracts to provide minor support services to Board Members in connection with their performance of Board functions.

202:29

NSB-78-407

GOVERNMENT IN THE SUNSHINE ACT REGULATIONS OF THE NATIONAL SCIENCE BOARD (EXCERPT FROM THE FEDERAL REGISTER, VOL. 42, NO. 51, WEDNESDAY MARCH 16, 1977)

The following regulations implement the policy of the United States and of the National Science Board (NSB) to give the public open access to the decisionmaking of the Board to the fullest extent that is practicable, consistent with the rights of individuals, and consistent with the ability of the Board and the Federal Government generally to carry out their responsibilities. It will be the general rule of the Board that every portion of every meeting of the National Science Board will be open to public observation. Certain exceptions to this rule will be made to protect the rights of citizens and the functioning of the Board and the Foundation. The following regulations identify the conditions under which meetings may be closed under these exceptions and under which certain other information may be withheld. They also prescribe procedures for closing meetings, for handling the transcripts or recordings of closed meetings, and for making public announcements of Board meetings and meeting changes.

Sec.
614.1 General rule.
614.2 Grounds for closing meetings.
614.3 Materials relating to closed portions of meetings.
614.4 Opening of transcript or recording.
614.5 Public announcement.
614.6 Meeting changes.
614.7 Record vote.
614.8 Application to Board Executive Committee.

Authority: Government in the Sunshine Act, sec. 552b of Title 5, United States Code: 90 Stat. 1241.

§614.1 General rule. Except as otherwise provided in these regulations, every portion of every meeting of the National Science Board will be open to public observation.

§614.2 Grounds for closing meetings.

(a) The National Science Board may by record vote close any portion of any meeting if it properly determines that an open meeting:

(1) Is likely to disclose matters that (i) are specifically authorized under criteria established by Executive Order to be kept secret in the interests of national defense or foreign policy and (ii) are in fact properly classified pursuant to the Executive Order;

(2) Is likely to relate solely to the internal personnel rules and practices of the National Science Foundation;

(3) Is likely to disclose matters specifically exempted from disclosure by statute (other than 5 USC 552): PROVIDED, That the statute (i) requires in such a manner as to leave no discretion on the issue that the matters be withheld from the public, or (ii) establishes particular criteria for withholding or refers to particular types of matters to be withheld.

(4) Is likely to disclose trade secrets and commercial or financial information obtained from a person and privileged or confidential;

(5) Is likely to involve accusing any person of a crime, or formally censuring any person;

(6) Is likely to disclose personal information where the disclosure would constitute a clearly unwarranted invasion of personal privacy;

(7) Is likely to disclose investigatory law-enforcement records, or information which, if written, would be contained in such records, but only to the extent provided in 5 USC 552b(c)(7);

(8) Is likely to disclose information contained in or related to examination, operating or condition reports prepared by, on behalf of, or for the use of an agency responsible for the regulation or supervision of financial institutions;

(9) Is likely to disclose information, the premature disclosure of which would:

(i) In the case of information received from an agency which regulates currencies, securities, commodities, or financial institutions, be likely to (i) lead to significant financial speculation in currencies, securities, or commodities, or (ii) significantly endanger the stability of any financial institution; or

(ii) Be likely to significantly frustrate implementation of a proposed Foundation action, unless the Foundation has already disclosed to the public the content or nature of its proposed action or is required by law to make such disclosure on its own initiative before taking final action; or

(10) Is likely to specifically concern the Foundation's participation in a civil action or proceeding, an action in a foreign court or international tribunal, or an arbitration.

(b) Anyone who believes his interests may be directly affected by a portion of a meeting may request that the Board close it to the public for any reason referred to in paragraphs (a)(5), (6), or (7) of this section. The request should be addressed to the National Science Board, National Science Foundation, Washington, D.C. 20550. It will be circulated to Members of the Board if received at least three full days before the meeting, and on motion of any Member the Board will determine by record vote whether to close the affected portion of the meeting.

§614.3 Materials relating to closed portions of meetings. If a portion or portions of any meeting of the National Science Board are closed to the public under §614.2:

(a) The General Counsel of the National Science Foundation shall publicly certify that, in his opinion, that portion or portions may properly be closed to the public. The certificate shall state the exemptions under 5 USC 552b(c) that make the closings proper.

(b) The presiding officer of the meeting (usually the Chairman of the Board) shall furnish a statement setting forth the time and place of the meeting and the persons present.

(c) The Board shall make a complete transcript or electronic recording adequate to record fully the proceedings of each portion of the meeting that is closed to the public.

(d) The National Science Board Office shall maintain the General Counsel's certificate, the presiding officer's statement, and the transcript or recording of the meeting for at least two years after the meeting and at least one year after the Board completes consideration of any proposal, report, resolution, or similar matter discussed in any closed portion of the meeting.

§614.4 Opening of transcript or recording.

(a) Except as otherwise provided in this section, the transcript or electronic recording of every portion of every meeting closed to the public will promptly be made available on request to any member of the public in an easily accessible place. The National Science Board Office will furnish to any member of the public on request copies of the transcript or of a transcription of the recording disclosing the identity of each speaker, and will charge for the copies or transcriptions no more than the actual cost of duplication or transcription.

The Board will, however, withhold the transcript or recording of the discussion of any agenda item if the Chairman of the Board or a Board Member designated by him determines that the discussion contains information which should be withheld under the same standards as apply for closing meetings under §614.2.

(c) The Board will release any transcript or recording withheld under this paragraph (b) when the Chairman of the Board or any person designated by him determines that the grounds for withholding it no longer apply.

(d) A request under paragraph (a) of this section should be directed in writing to the Executive Secretary, National Science Board, should clearly state what is requested, and should contain a promise to pay the costs of any duplication or transcription requested.

§614.5 Public announcement.

(a) Except as provided in paragraphs (c) and (d) of this section, the National Science Board will make a public announcement of each Board meeting at least one week before the meeting takes place.

The announcement will cover:

(1) The time, place, and subject matter of the meeting;

(2) What portions of the meeting, if any, are to be closed to the public; and

(3) The name and telephone number of the official designated to respond to requests for information on the meeting.

(b) Each such announcement will be promptly posted on public notice boards at the National Science Foundation and made available to journals of general scientific interest. Immediately following the issuance of such an announcement, it will be submitted for publication in the Federal Register.

(c) The announcement may be made less than a week before the meeting it announces or after the meeting only if:

(1) the Board by record vote determines that agency business requires the meeting to be called on such short or after-the-fact notice; and

(2) an announcement is made at the earliest practicable time.

(d) All or any portion of the announcement of any meeting may be omitted if the Board by record vote determines that the announcement would disclose information which should be withheld under the same standards as apply for closing meetings under §614.2.

§614.6 Meeting changes.

(a) The time or place of a meeting of the National Science Board that has been publicly announced as provided in §614.5 may subsequently be changed, but any such change will be publicly announced at the earliest practicable time.

(b) The subject matter of any portion of any meeting of the Board that has been publicly announced as provided in §614.5 or the determination whether any portion of any meeting so publicly announced will be open or closed may subsequently be changed, but only when:

(1) The Board determines by record vote that agency business so requires and that no earlier announcement of the change was possible; and

(2) The Board publicly announces the change and the vote of each Member on the change at the earliest practicable time.

§614.7 Record vote.

(a) For purposes of this part a vote of the National Science Board is a 'record vote' if:

(1) It carries by a majority of all those holding office as Board Members at the time of the vote;

(2) No proxies are counted toward the necessary majority; and

(3) The individual vote of each Member present and voting is recorded.

(b) Within one day of any such record vote or any attempted record vote that fails to achieve the necessary majority under paragraph (a)(1) of this section, the Board Office will make publicly available a written record showing the vote of each Member on the question.

(c) Within one day of any record vote under which any portion or portions of a Board meeting are to be closed to the public, the Board Office will make available a full written explanation of the Board's action and a list of all persons expected to attend the meeting, showing their affiliations.

§614.8 Application to Board Executive Committee.

All the provisions of this part applicable to the National Science Board shall apply equally to the Executive Committee of the Board whenever the Executive Committee is meeting pursuant to its authority to act on behalf of the Board.

* * *

These regulations were published in proposed form in 41 FR 54956 on December 16, 1976. Comments received have been carefully considered. The principal points raised and the Foundation's response follow:

1. Comment: The Board should be required to decide by majority vote whether a document considered at a Board meeting shall be kept secret.

Response: The Foundation's currently effective Freedom of Information Act regulations (45 CFR Part 612) cover the availability of documents, including documents considered at Board meetings. Meaningful detailed consideration by the full National Science Board of what parts of what documents may be and should be withheld would be impractical and a poor use of its limited time.

2. Comment: The regulations should permit requests from the public for reconsideration of decisions to close meetings.

Response: Inclusion of a formal provision is not required by law and appears unnecessary. The staff of the Board will consider any such requests and bring them to the attention of the Chairman.

3. Comment: Any decision not to release all or parts of the transcript of a closed meeting should be taken in the same manner as a decision to close all or parts of the meeting--by record vote of the Board.

Response: Such a requirement is conspicuously absent in 5 USC 552b(f)(2). Section 614.4(c) of the Board's regulations, which provides for release by the Chairman or his designee, should speed and simplify the release of information, since the Board meets as a whole only at intervals of a month or more.

4. Comment: Budget deliberations of the Board are not per se excempt under the Act.

Response: The regulations do not make budget deliberations per se exempt. The Board will generally follow Administration guidance on interpretation of the Act in determining what budget deliberations to conduct in closed session.

5. Comment: The preamble to the NSB regulations indicates that there will be cases in which Board recommendations to the President will be considered in closed session to prevent premature disclosure. Agency recommendations to the President are not ipso facto within exemption 9B.

Response: The proposed regulations do not require recommendations to the President to be considered in closed session. However, the Board may find in individual cases that deliberations on some such recommendations are within the exemption. This is consistent with its legislative history.

6. Comment: Section 614.2(a) should be amended to require, besides a finding that the subject matter falls within a specific exemption, a finding that the public interest mandates a closed meeting.

Response: Proposed §614.2(a) states that the Board may close portions of meetings if it properly determines that the subjects under discussion fall within one of the exemptions. In other words, the section is permissive, not mandatory. In deciding whether or not to close any discussion the Board will naturally be guided by the public interest provision of the Act.

7. Comment: Section 614.2(a)(9)(i), which reflects exemption 9A of the Act, is not available to the Board and should be deleted from the regulations.

Response: The Board may conceivably receive information from a government agency within the scope of 9A. The provision which would allow the Board to consider any such information in closed session might be used in such a rare circumstance, but not otherwise.

8. Comment: Section 614.3(a) should be amended to make clear that the General Counsel's certificate must be presented before a meeting may be closed.

Response: The Act says only that 'for every meeting closed' the General Counsel shall certify. It does not say when he shall certify. The certificate normally will nonetheless be executed before any meeting of the Board is closed. Instances may arise in which the certificate will not be reduced to written form before the closed meeting, however, even though the Board's resolution to close will be made with advice from the General Counsel. This might occur, for example, when items that cannot be postponed are added to a closed-meeting agenda at the last minute. Thus, §614.3 is consistent with the text of the Act and provides appropriate flexibility for special circumstances.

9. Comment: Section 614.4(a) should be amended to make the transcript or recording of a closed meeting publicly available on the Board's own initiative, whether or not a public request for it is made.

Response: The Act does not require that the transcript be made available before a request is made. The Board has been conducting its meeting under the Act for several months, during which no request for a transcript or recording has yet been made. Preparation of a transcript or recording for release, with accompanying decisions on what will and will not be withheld, is costly. The Board's experience thus far indicates that anticipatory expenditure of the taxpayers' money for this purpose would be unjustified. Should the frequency of requests for transcripts materially increase, however, the Board will reconsider this matter.

10. Comment: Section 614.5(b) should be amended to provide for the posting on public notice boards of meeting announcements and related information.

Response: This has been done.

COMPENSATION FOR BOARD MEMBERS

NSB was notified that P.L. 95-99 authorized compensation for NSB members at the GS-18 level. Members would be paid at the daily rate for GS-18s. In addition members are authorized travel funds in accordance with Sec. 5703 of Title V of the U.S. Code.

192:4-5

FUNDING FOR NSB SUPPORT SERVICES AT MEMBERS' HOME INSTITUTIONS

Proposed Regulations Exempting Board Members from Certain Financial Conflict of Interests

The General Counsel introduced the proposed regulations on support services for Board Members which had been published in November in the Federal Register. These regulations will enable Board Members to apply to the Chairman for financial assistance from the Foundation on handling Board business at their home institutions.

Since no inquiries or recommendations were received, the General Counsel proposed that the Board adopt these regulations. The Board then acted as follows:

NSB/Res-79-27	The Board unanimously ADOPTED the regulations on support services for Board Members that were published in the Federal Register on November 29, 1978 (NSB-79-90--Members' Books, Tab D).

205:13

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

NSB-79-450
(Revised)

NSB Policy

December 6, 1979

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

SUBJECT: Policy Concerning NSB Committee Meetings

From time to time, questions arise as to whether NSB Committee meetings are open to the public. The current policy with regard to meetings of the Board itself and its Executive Committee is as follows:

1. It is the policy of the National Science Board (NSB) to give the public open access to the decisionmaking of the Board to the fullest extent that is practicable, consistent with the rights of individuals, and consistent with the ability of the Board generally to carry out its responsibilities. It is the general rule of the Board that every meeting of the National Science Board will be open to public observation. Certain exceptions to this rule are made to protect the rights of citizens and the functioning of the Board and the Foundation. The Government in the Sunshine (GIS) regulations of the National Science Board (45CFR §614) identify the conditions under which meetings may be closed.

2. All provisions of the NSB GIS regulations applicable to the Board apply equally to the Executive Committee of the Board whenever the Executive Committee is meeting pursuant to its authority to act on behalf of the Board (§614.8).

It is proposed that the Board adopt the following paragraphs concerning other committee meetings as NSB policy.

3. It is the policy of the National Science Board that meetings of the Executive Committee when not meeting pursuant to its authority to act on behalf of the Board, and all other NSB committees, shall not be open to public observation in order to preserve the deliberative processes and to permit the members of the committees to express frank, uninhibited, and perhaps personal opinions in a setting where no final decisions or ultimate responsibilities lie. Such final decisions are the responsibility of the Board.

4. Board committee chairmen may, on occasion, after consultation with the Board Chairman, invite experts to meet with Board committees to discuss items of special interest to the committees.

These policies concerning public observation of Board and committee meetings are in compliance with the Government in the Sunshine Act.

Norman Hackerman
Chairman

APPENDIX C

NSB-80-72

POLICY STATEMENT ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 212TH MEETING ON JANUARY 17-18, 1930 ON PUBLIC ATTENDANCE AND PARTICIPATION AT BOARD AND BOARD COMMITTEE MEETINGS

It is the policy of the National Science Board (NSB) to give the public open access to the decisionmaking of the Board to the fullest extent that is practicable, consistent with the rights of individuals, and consistent with the ability of the Board generally to carry out its responsibilities. It is the general rule of the Board that every meeting of the National Science Board will be open to public observation. Certain exceptions to this rule are made to protect the rights of citizens and the functioning of the Board and the Foundation. The Government in the Sunshine (GIS) regulations of the National Science Board (45CFR §614) identify the conditions under which meetings may be closed.

All provisions of the NSB GIS regulations applicable to the Board apply equally to the Executive Committee of the Board whenever the Executive Committee is meeting pursuant to its authority to act on behalf of the Board (§614.8).

It is the policy of the National Science Board that meetings of the Executive Committee when not meeting pursuant to its authority to act on behalf of the Board, and all other NSB committees, shall not be open to public observation in order to preserve the deliberative processes and to permit the members of the committees to express frank, uninhibited, and perhaps personal opinions in a setting where no final decisions or ultimate responsibilities lie. Such final decisions are the responsibility of the Board.

Board committee chairmen may, on occasion, after consultation with the Board Chairman, invite experts to meet with Board committees to discuss items of special interest to the committees.

These policies concerning public observation of Board and committee meetings are in compliance with the Government in the Sunshine Act.

212:34

APPENDIX F

NSB/C-75-14
(Limited
Distribution)

SUMMARY OF DISCUSSIONS AT THE MEETINGS OF TASK FORCE 75-A JUNE 18-20, 1975

Issue: How should the National Science Board conceive of a study of itself and how should such a study be conducted?

[Propositions]

I. Task Force 75-C prepared the beginnings of a broad outline for:

   a. Thinking about the overall objectives of the National Science Board and its relationship to more specific activities and functions which are or might be carried out by the Board and the Foundation;

b. Examining the organizational structure and practices of the Board and assessing its effectiveness in responding to these multiple objectives.

2. The task force unanimously agreed on the following definition of objectives for the Board: improve human welfare through:

a. Increasing scientific knowledge,
b. Disseminating scientific knowledge,
c. Identifying and delineating alternative applications of science, and
d. Encouraging applications of science.

3. The task force discussed the Administration's bill to create an Office of Science and Technology Policy (OSTP) in the White House and:

a. Pointed to this as one example of a broader set of science and technology issues affecting the Nation which the Board seemed unequipped to deal with or respond to, collectively;

b. Considered the need for some institutionalized mechanism which would regularly alert the Board to issues of this sort and assist it in developing an informed, collective position on them;

c. Unanimously adopted a resolution recommending that the Board develop and express a policy position on the Administration's bill for OSTP.

4. task force discussed, in light of the broad objectives iously adopted, various "input" and "output" deficiencies current Board organization and procedures including:

a. Less than adequate means for communicating with the scientific community, soliciting views on scientific and policy matters;

b. Absence of mechanisms for identifying national scientific policy issues and delineating broad policy positions for the Board;

c. Continuing inability of the Board to delegate administrative matters to subcommittees and to rely more on their recommendations instead of reconsidering everything;

d. Experimenting with ways to get the Board to do its "homework," e.g.:

(1) Send shorter papers and encourage Members to prepare their comments in advance of meetings,
(2) Schedule conference calls to discuss issues, and
(3) Circulate minutes, Board comments prior to meetings.

5. The task force considered some alternatives which might, potentially, improve some of these deficiencies including:

a. Staffing patterns for the Board:

(1) Alternative 1--Continue present arrangements with the Foundation providing staff on an "as needed" basis.

(2) Alternative 2--Appoint a full-time Board staff with a full-time executive director.

(3) Alternative 3--Assign each Board Member a full-time staff person.

(4) Alternative 4--Have a small core of full-time staff and an executive director with the Foundation assigning additional staff on selected issues, e.g., Board reports, on an "as needed" basis.

b. Recommending changes in the NSF Act which would permit more delegation, especially on approval of awards, to Board subcommittees;

   c. Organizing workshops and getting greater assistance from scientific societies and associations in establishing scientific priorities and allocating resources across disciplines.

6. The task force decided that it should develop its own ideas and positions further before involving an outside consultant in the process.

Recommendations to the Board

1. The task force recommended that the Board should define a wider, more active, national policy role for itself in light of the four objectives:

   a. Increasing scientific knowledge,
   b. Disseminating scientific knowledge,
   c. Identifying and delineating alternative applications of science, and
   d. Encouraging applications of science;

   OR

   accept its present role and operational procedures and stop studying itself.

2. The task force decided that there seemed to be a number of deficiencies in the way the Board operated at present including:

   a. Inadequate policy content to program reviews;

   b. Devotion of too much time to discussions of Programs Committee recommendations;

   c. Inadequate input from scientists, professional societies, citizens; and

   d. No mechanism for identifying broad, national policy issues or for responding to them;

   and that, IF the Board wanted to improve these deficiencies AND adopt a wider role for itself, it should undertake a complete review of the resources and changes necessary to accomplish these objectives.

3. The task force recommended that the Board develop a public position on the Administration's bill for an Office of Science and Technology Policy.

L. Vaughn Blankenship
Executive Secretary
Task Force 75-A

August 6, 1975

Approved by Task Force Chairman
on July 25, 1975

PUBLICATION OF "STRENGTHENING ENVIRONMENTAL PROGRAMS"

Programs Committee

Thirty-seventh Meeting--March 17-18--Dr. Reynolds, Chairman, stated that the Committee had considered the report of its Subcommittee on Environmental Programs (chaired by Dr. Gates) entitled Strengthening Environmental Programs and recommended that it be issued, subject to such editorial changes as are deemed necessary, as a Category II report. This category of report is that of a report of a committee of the Board to the Board on which complete consensus is not expected; the report is to stimulate interest and discussion. Dr. Gates briefly summarized the report and its recommendations on four major areas: lake systems, urban hydrology, role of Gulf of Mexico in relation to climate, and drought. His principal concern is that the Board take seriously the recommendations contained in the report in planning future programs and budget estimates. He offered to assist in preparing this document for publication.

The Board Chairman asked that the Committee on Budget take note of the recommendations in the report in its future planning.

> The Board unanimously ACCEPTED the recommendation of the Programs Committee that Strengthening Environmental Programs be published as a Category II document.

180:30

POLICY RELATING TO RESEARCH FUNDING AND AWARD MECHANISMS

RESEARCH FUNDING POLICY

Statement Adopted by the National Science Board on May 17, 1968, Concerning the Proposed Denial of National Science Foundation Benefits to Persons Disobeying University or College Regulations

On May 8, 1968, the House of Representatives passed H.R. 17023, the Independent Offices and Department of Housing and Urban Development Appropriation Bill for fiscal year 1969, with an amendment, relating to the National Science Foundation, as follows:

> ". . . no part of this appropriation shall be available for or paid out to the benefit of any individual who at any time after the effective date of this Act, wilfully refuses to obey a lawful regulation of the university or college which he is attending or at which he is employed."

The National Science Board shares the concern of many Americans with the growing disorder and use of disruptive tactics on academic campuses. The reestablishment of confidence and of mutual trust among students, faculty, administrators and the public generally is critically needed.

Although student and faculty involvement in international, national, local and campus problems is entirely commendable and there can be no question of the rights of freedom of speech and of assembly in these regards, no educational institution or other segment of society can function in disorder, nor should their decisions be made under the threat of force.

However, we believe that the proposed mechanism, which was born out of anxiety and national concern for an acute problem, is in violation of traditional principles, is unlikely to achieve the desired result, and may well create new and serious problems.

The proposed legislation would be extremely difficult to implement with fairness and justice and would impose a large and inappropriate responsibility on a Federal agency charged with support of scientific research and science education. Further, even if the practical difficulties could be overcome, it is doubtful whether the legislation would have the desired effect. Indeed, it is likely that a student or faculty organization concerned with disciplinary action, or the officers of academic administration, might be reluctant to act in the knowledge that their decisions would not only be enforced by the institution's own penalties but would automatically entail the loss of present or future eligibility for support from Federal funds.

The proposed penalty for student violations is inequitable: it is harsh and uniform for all infractions without regard to the severity of the offense, it falls only upon those students who are or might be supported by Federal funds, and it would be most damaging to those students from the economically disadvantaged sector of our society. Similar considerations apply to the penalty proposed for violations by faculty and staff members whose activities are supported by the National Science Foundation.

The National Science Board is opposed to use of the power to deny or rescind Federal grants, loans and fellowships as a means of augmenting the penalties flowing from violation of the internal regulations of educational institutions or other public and private organizations. Penalties for infractions of whatever character should be imposed only through the operation of processes specifically designed for the purpose and with due regard for all our traditional safeguards against false accusation or arbitrary procedure.

NATIONAL SCIENCE FOUNDATION
OFFICE OF THE DIRECTOR
Washington, D.C. 20550

STAFF MEMORANDUM

November 19, 1969

GRANTS AND CONTRACTS

O/D 69-36

Subject: Categories of Proposal Declinations

It has become increasingly evident that the Foundation needs more detailed information about the reasons for declination decisions and must be able to compile the data rapidly from a central source. The following outlines a mechanism for meeting these needs. Withdrawal actions are not affected.

1. Declination Categories. Effective December 1, 1969, declination actions will be subdivided into two broad categories defined as follows:

   a. Declinations--Funds Limitation. This category includes all proposals deserving of support which are declined due to limitations in available funds. If program funding levels were increased sufficiently, proposals in this category would warrant support due to their quality, merit, and appropriateness.

   b. Declinations--Other. This category includes all proposals declined for any reason other than limitations in funds. Reasons for declination in this category may include among others, lack of merit in the substance of the proposal, lack of adequate research facilities, inappropriate support from local administration, etc.

2. Responsibility. Program Directors are responsible for identifying the appropriate category for each proposal recommended for declination. The decision made at the Division level or equivalent will enter the data system at the time the declination letter is signed. The Data Management Systems Office will record the information in the NSF master file and

produce the required statistical reports. Assistant Directors have the responsibility to review the statistics on declination categories from their Programs and take actions necessary to assure consistency and resolve procedural questions which may arise.

3. Procedures. Until input forms are revised to include a block for declination categories, the following procedures will apply. The terms "No-Fund" and "Other" should be used as shorthand designations for the declination categories. In Offices and Divisions using AD/R system forms, the category should be recorded on the status cards (Forms 24) used to input the declination decision to the data center. In all other Offices and Divisions the category should be noted in the "Remarks" block of the Form 68 along with the item number for "Declination Date". Example: Item 31 - No-Fund.

4. Effect on Proposal Processing. The identification of declination categories is for the purpose of developing summary statistical analyses. Within the context of the Freedom of Public Information Act of 1967 the information on individual proposal declination categories placed in the central data system is privileged and for internal use only. This Memorandum in no way changes the criteria for review of proposals or decision-making. Nor is there any change in the information to be supplied in declination letters or supplementary communications at this time.

5. Implementation. The declination category will be recorded by Programs on all documents submitted after November 30. In order to compile the information for proposals declined between July 1 and November 30, DMS will supply computer listings to each Program for annotation and input.

W. D. McElroy
Director

AMENDMENT OF GRANTS AND CONTRACTS

In order to provide the same flexibility with respect to making amendments to grants, contracts and other arrangements which have been specifically approved by the Board, as existed under delegations from the Board prior to the July 1968 amendment to the National Science Foundation Act, the Board took the following action:

> The Board unanimously AGREED that each resolution of the Board approving the commitment by the Director of a specific amount of funds by contract, grant or other arrangement shall, unless it specifically states otherwise, be deemed to include approval for the Director, at his discretion, to amend the instrument to commit additional sums, not to exceed 10 per cent of the amount specified, or to change the expiration date of the instrument.

GRADUATE STIPENDS

Supplementation of Graduate Fellowship and Traineeship Stipends

The Board unanimously APPROVED the following changes in the guidelines for supplementation of stipends of Foundation Graduate Fellows and full-time Trainees:

(1) The basic stipend of NSF Graduate Fellows and Trainees in their first year of graduate residence at an institution--regardless of level of graduate study--may be augmented from institutional funds (see (3) below) by not more than $1,000 for a tenure of a full calendar year or $750 for a tenure of nine months. Prior approval from the Foundation must be obtained for any exception to this limitation.

(2) NSF Fellows and Trainees who are in the second or subsequent years of graduate residence at the same institution may have their stipends supplemented from institutional funds, in cases of hardship and/or for services, in such amounts as are in accordance with the supplementation policies of the fellowship or traineeship institution.

(3) In the context of these guidelines, funds that the institution has obtained from external (including Federal) sources may be considered as institutional funds. When appropriate, NSF program grants may be used for supplementation in an amount not to exceed $1,000 per year for any Federally assisted fellow or trainee.

130:9

COST SHARING POLICY (NSB-70-161--distributed at the meeting)

Mr. Bolton presented the Director's plan to modify the Foundation's policy with respect to the cost sharing required of educational institutions under research grants.

The Board unanimously APPROVED changing the Foundation's policy with regard to cost sharing on research projects by (a) discontinuing the mandatory faculty salary matching requirement, and (b) permitting an "averaging" cost sharing procedure as an optional accounting mechanism for cost sharing on a project-by-project basis, provided each project has at least "token" sharing.

131:19

CRITERIA PAPER

The Board approved an amended version of the paper, "Criteria for the Selection of Research Projects by the National Science Foundation" (copy attached as Appendix C) and suggested methods for its dissemination. The Board warmly thanked Dr. Brooks and Mr. Gruner for drafting this document.

167:5

CRITERIA
FOR THE SELECTION
OF RESEARCH PROJECTS
BY THE NATIONAL SCIENCE FOUNDATION

AS APPROVED BY THE NATIONAL SCIENCE BOARD
AT ITS 167TH MEETING
OCTOBER 17-18, 1974

SUMMARY

The National Science Foundation administers several different programs of research support corresponding to several legislatively assigned objectives. To the maximum degree possible, these activities are designed to utilize and enhance existing scientific research potential and institutions. Purposeful adjustments are made when indicated.

In the selection of individual projects a number of widely understood and acknowledged criteria are considered. In different programs, the different criteria must be assigned different weights, according to the objectives being pursued. Also these criteria relate in different ways to the distinctive characteristics of different types of research-performing organizations.

INTRODUCTION

Policy Context

Public support of scientific research, specifically including *basic* research, is an accepted feature of United States public *policy*. Such support has two recognized major objectives:

- -- To foster and maintain basic research as an investment toward future opportunities, as insurance against unforeseeable future dangers, and as a vital element of culture;
- -- To bring about prompt, effective performance of applied research and problem-oriented basic research--insofar as specific needs for these can be foreseen in the light of current understanding.

The National Science Foundation

It is not possible to make the distinction between basic and applied research a sharp one, and the Foundation is one of several Federal agencies that support research of both kinds. The Foundation, however, is unique in its mission to foster basic research *per se* and in its responsibility for future scientific research capability. Thus the National Science Foundation Act of 1950, as amended, authorizes "programs to strengthen scientific research potential" as well as "scholarships and graduate fellowships." The Act authorizes support both of basic and of applied research and--in combination with Presidential directive--use of an unrestricted range of performers.

Agency Objectives and Methods

The Foundation thus has been charged with advancing several different but interrelated major objectives:

- -- Accomplishment of basic research;
- -- Accomplishment of applied research in selected areas;
- -- Long-term maintenance and strengthening of potential to accomplish both basic and applied research in the future.

This range of objectives has been reflected in the development of several different program formats for NSF support of research. But despite the approximate correspondence of programs to objectives, it remains true that research support actions are often taken with more than a single end in view. Thus the Foundation's method of pursuing any one objective may be modified or restricted by consideration of the others.

Functions Performed

Where research support is concerned, functions performed by the Foundation include:

- -- Allocation of resources to fields of science, to classes of scientific activity, or to areas of application;
- -- Selection of individual projects to be supported;
- -- Direct establishment or adjustment of institutional structures or capabilities.

CRITERIA

Allocation of resources to fields of science and to areas of application is not further discussed in this notice, but many of the criteria for individual project selection require only slight modification for use at the higher levels of aggregation. Criteria for the creation or modification of institutional structures are dealt with in a separate section.

The following is an enumeration of criteria employed in the selection of research projects. To simplify later discussion, they are grouped in four categories.

Category A

Criteria relating to competent performance of research--the technical adequacy of the performer and of his institutional base:

1. The scientist's training, past performance record, and estimated potential for future accomplishment;

2. The scientist's demonstrated awareness of previous and alternative approaches to his problem;

3. Probable adequacy of available or obtainable instrumentation and technical support.

Category B

Criteria relating to the internal structure of science itself:

4. Probability that the research will lead to important discoveries or valid, significant conceptual generalizations within its field of science or (in the most favorable cases) extending to other fields as well;

5. Probability that the research will lead to significant improvements or innovations of investigative method--again with possible extension to other fields of science.

Category C

Criteria relating to utility or relevance:

6. Probability that the research can serve as the basis for new invention or improved technology;

7. Probable contribution of the research to technology assessment--i.e., to estimating and predicting the direct and indirect, intended and unintended effects of existing or proposed technologies;

8. Identification of an immediate programmatic context and user of the anticipated research results.

Category D

Criteria relating to future and long-term scientific potential of the United States:

9. Probable influence on the research upon the capabilities, interests, and careers of participating graduate students, postdoctoral associates, or other junior researchers;

10. Probability that the research will lead to radiation and diffusion, not only of technical results, but also of standards of workmanship and a tradition of excellence in the field;

11. Anticipated effect upon the institutional structure of U.S. science.

Because none of these considerations is susceptible to precise quantification, or even in most cases to unambiguous rank ordering, it would be more accurately descriptive to speak not of "criteria" but rather of "factors considered." Moreover, very different relative weights must be attached to the different factors in the case of different agency objectives or programs, as is explained in a later section.

Discussion

The first three criteria--those relating to competent execution--are given first consideration in every program. Every NSF-supported project is expected at the least to produce some valid new information or relationships. The best way to ensure this is to insist upon competent scientists and adequate facilities. All other considerations which follow, then, are predicated upon the assumption that these first three criteria are universally applied and that competent performance will be the normal expectation.

Criteria 4 and 5--those relating to the internal structure of science--summarize succinctly what the scientific community understands by the phrase "intrinsic scientific merit."

Criteria 6 and 7--those relating to utility or relevance--cannot be made entirely distinct from the preceding two, since that science judged best by internal standards has almost invariably turned out in the long run to be the most useful. Valid generalizations and powerful methods of observation and measurement usually lead to new invention, improved technology, and more confident assessment. Conversely, applied investigations designed to support invention, technology, and assessment tend to succeed in these purposes to the extent that they do uncover valid generalizations or improved methods. Thus differences between the two types of criteria are mainly ones of motivational specificity and time horizon. Research is properly termed "applied" when we visualize using the results in a very specific context--usually defined in terms of some already-formulated systems concept--or when we expect it will prove diagnostic of some already-recognized problem.

This specific relationship of applied research to a particular systems concept and plan of development is made still more explicit in criterion 8.

Criteria 9, 10, and 11--those relating to long-term scientific potential--address not so much the content of the research as the circumstances under which it is performed. They include, of course, the quality of training of scientists, but extend beyond this to the processes of scientific communication and publication, the evolution of traditional scientific disciplines, the spawning of new "interdisciplinary" disciplines, the manner in which scientific careers are developed, the organizational structures and settings in which all this goes on, and in general how the scientific tradition and the living corps of scientific capability of our Nation are maintained. While these criteria are seldom dominant in project selection or program development, they are always considered. The policy of the Foundation is not to undertake for short-term reasons any action which would seriously jeopardize the long-range science potential of the Nation.

APPLICATION TO SPECIFIC PROGRAMS

As has been described, the first three criteria are vigorously applied in all Foundation programs, and the last three also are always kept in view. More specialized emphases characterize individual programs, as follows:

Scientific Research Project Support

In this core program the emphasis is overwhelmingly upon the criteria of intrinsic scientific merit (4 and 5). Consideration is also given to the utility criteria (6 and 7)--not on a project-by-project basis but rather as considerations influencing the general level of effort to be applied to entire fields and subfields of science. Considerable direct weight is also given to criteria 9, 10, and 11 (those relating to future and long-term potential). Projects are selected and administered not only to preserve but to enhance the essential character of proven successful institutions. Thus it is Foundation policy to encourage such institutional and organizational features as:

Participation in research by graduate students;

Open publication of research results in the standard literature;

Widest possible access to unique facilities for interested and competent scientists;

Emphasis upon originality, elegance, and economy of method in university research; and

Maintenance of vigorous informal communication through symposia, workshops, scientific meetings, etc.

Energy-Related General Research is administered as a specialized augmentation of Scientific Research Project Support. Here the utility criteria (6 and 7) play a major role--being decisive in selection of scientific areas eligible for participation. Within the eligible areas, individual projects compete on the basis of scientific merit. Criteria 9, 10, and 11 here play a role which is less direct and more passive than for the core Scientific Research Project Support Program.

National and Special Research Programs

The relative weight of the different criteria for these programs is essentially the same as for the Scientific Research Project Support discussed above. But, because there are for the most part large-scale coordinated efforts, often including a logistic component and requiring special planning and management, somewhat greater consideration is required for organizational and institutional factors (criterion 11)--as is further discussed in a later section.

Research Applied to National Needs

Here, criteria of utility (6, 7, and 8) play a dominant role. Criteria of scientific merit and long-range future potential, of course, are also considered. The utility criteria 6, 7, and in most cases 8, are applied to individual grants on a project-by-project basis. To help potential investigators meet these criteria and to ensure programmatic coherence, the Research Applications Directorate issues from time to time:

Divisional program brochures;

Guidelines for preparation of unsolicited proposals;

"Program Solicitations;" and occasionally,

"Requests for Proposals."

Applicants for support are encouraged and assisted to establish communications with potential users of their results at an early stage of negotiations.

Criteria for Actions Which Create or Modify Institutional and Organizational Structures

Actions of this type occur frequently in the support of National Research Centers and under the National and Special Research Programs. The applicable criteria reflect greater intervention and responsibility on the part of the Government and decisions at a higher level of aggregation. They include:

Criteria of Need

Evidence of a real scientific need and an opportunity to attack important problems in a way, or on a scale, not otherwise feasible or available.

Evidence that the program objectives can better be achieved through the organization of a new structure than through use of an existing one.

Criteria of Long-Range Potential

Formulation of a mission well enough and broadly enough defined to hold out prospects of high scientific productivity over an extended period.

Evidence that a significant number of first-class scientists (as judged by their peers) believe deeply in the proposed activity and are willing to commit their personal scientific careers to it.

Evidence that the new structure and its programs will strengthen rather than detract from related work performed in other settings.

RELATIONSHIP TO SOME CHARACTERISTICS OF RESEARCH-PERFORMING ORGANIZATIONS

NSF policy is to use and reinforce proven strengths of U.S. scientific institutions. These institutions include organizations of different types, such as:

Universities and colleges;

Industrial research laboratories and in-house laboratories of Federal agencies;

"National Centers" and other federally funded research centers;

Vendors of R&D services.

The Foundation seeks to avoid inadvertently changing the characteristics of proven organizations--either through individual actions, or as the cumulative result of many actions. Purposeful changes may occasionally be encouraged for specific reasons. Some relevant characteristics of the different types of organization include the following:

Universities and colleges (academic institutions proper) have as their two principal missions teaching and the development and propagation of new knowledge and understanding. As applied to these organizations, therefore, criteria 9 and 10 may be regarded as criteria of "mission relevance."

Academic organizations, traditionally, are deeply committed to considerations of intrinsic scientific merit (criteria 4 and 5) in developing and selecting their own research programs. This is largely a consequence of peer evaluation and peer pressure exerted upon the individual scientist.

Organization along disciplinary lines is a prominent feature of academic research tradition. This is an indispensable virtue insofar as it guarantees comprehensive peer evaluation of scientific research results, but it presents some limitations for problem-oriented research. It should be borne in mind that new disciplines emerge from time to time and that the focus of established disciplines evolves continually.

Academic environments also tend to place extreme value upon originality, methodological elegance, and upon the initiative and scientific judgment of the individual investigator. This characteristic again presents some limitations for problem-oriented research.

Industrial research laboratories and Federal agencies' in-house laboratories generally have as their mission the generation of new knowledge and understanding in areas judged to be of immediate or potential concern and use in carrying out the commercial activities of the parent company or the mission of the agency.

"National Centers" and federally funded research centers have as their mission the generation of new knowledge and understanding judged to be needed or desirable in the public interest. These organizations are generally established to provide specialized research environments not readily obtainable in organizations of the other types.

Vendors of R&D services include many of the "not-for-profit" R&D organizations and also a number of--usually more specialized--R&D companies. These organizations, in addition to maintaining some level of independent research, are unique in the extent to which they undertake contract research on topics and problems designated by outside purchasers. Collectively they constitute a reservoir of general purpose research capability for hire.

Discussion

Different factors tend to determine the scope and complexion of the research programs in the different types of organizations. Thus universities tend to be complement limited. For them the primary management decision is how many professional staff (faculty) to employ and which particular ones. Subsequently, these individuals determine program content. Industrial and mission agency in-house laboratories are "mission determined." That is, activity is weighed and selected according to mission requirements. Finally, R&D vendors are, at least to some extent, capability and market limited. Foundation policy is to recognize and, generally, to avoid disturbing these characteristic differences.

INSTITUTIONAL SUPPORT

Task Force A--Institutional Science Support (1974)

The Committee considered again the recommendations adopted by Task Force A at the June Board meeting (Appendix C, June Executive Session Minutes--copies distributed at the meeting). The three recommendations related to institutional support programs were: (1) programs to foster university-industry education programs at the graduate level; (2) programs to provide scientific equipment; and (3) targeted fellowship program.

> (1) University-industry education programs--Dr. Cooke pointed out that it was intended that these programs would make it possible for more university-trained persons, both Masters and Ph.D.'s, to pursue careers outside universities.
>
> > The Board unanimously APPROVED the development by the Director of university-industry educational programs at the graduate level along the guidelines proposed at the June Board meeting.
>
> (2) Scientific equipment--After considerable discussion of the relative advantages and disadvantages of cost sharing/matching funds for the purchase of equipment as a form of institutional support, the Board requested the Committee to consider further this matter by the following action:
>
> > The Board unanimously TABLED for a future meeting consideration of the recommendation of the Planning and Policy Committee regarding a special program for the purchase of scientific equipment;
> >
> > Further, the Board unanimously ENDORSED the emphasis placed upon the need for equipment in the Scientific Research Project Support program by the Director through the inclusion of increased funds in the fiscal year 1976 budget request.
>
> (3) The targeted fellowships program was aimed at developing an additional graduate fellowship program which would incorporate some aspects of the Committee's desire to include more women and minorities. During the discussion the Board amended the recommendations as proposed by the Committee and agreed on the following provisions and objectives: (a) fellowships to be awarded on the basis of merit (achievement and aptitude); (b) amount of fellowships to be based on need, including the concept of "prestige only" awards; (c) fellowships to be carried to institution of recipient's choice; (d) a significant support grant to the department selected by each fellowship recipient, to provide "cost of education" support, including equipment needs, as a means of ensuring sustained strength of selected departments; (e) a significant support grant to the undergraduate institution producing each fellowship recipient, as a means of providing strong

sources of well prepared and strongly motivated graduate students; and (f) an additional significant grant to the undergraduate institution producing each woman or minority fellowship recipient, as a means of encouraging the production and effective counseling of such individuals, and to be used for special counseling and other curricular and special programs. These guidelines are intended to aid the staff in developing this program.

> The Board unanimously APPROVED the establishment of a targeted graduate fellowship program with the provisions and objectives as set forth above.

ES:168:8-9

BASIC RESEARCH AT PROFIT-MAKING INSTITUTIONS

Planning and Policy Committee--Twenty-fourth Meeting--January 18

Dr. Cooke, Chairman, reported that the Committee discussed a number of items and reached consensus as follows:

Basic Research Support

The Committee continued its consideration of policy regarding basic research support by NSF and profit-making organizations. The Committee reviewed the practices of Scientific Research Project Support which restrict awards to profit-making institutions to exceptional cases as set forth in paragraph (3) on page 4 of "Grants for Scientific Research" (NSF 73-12):

> (3) Private Profit Organizations: Industrial organizations are infrequent recipients of awards from the Scientific Research Project Support Program. However, in exceptional cases, unsolicited proposals for basic research will be considered from industrial organizations where: (a) the project is of special concern from a national point of view and shows promise of solving an important scientific problem; (b) unique resources are available in industry for the work; or (c) the project proposed is outstandingly meritorious.

Upon the recommendation of the Committee, the Board acted as follows:

> The Board unanimously REENDORSED the policy regarding awards to profit-making organizations as set forth in paragraph (3) on page 4 of "Grants for Scientific Research" (NSF 73-12) quoted above.

ES:169:13

PEER REVIEW SYSTEM

The Chairman asked the Board to consider the Director's response to a letter dated May 15 from Representative John B. Conlan (R.-Ariz.) which had been delivered earlier in the day[1] (copies of this letter, Mr. Conlan's letters of May 1, 7, and 12 to the Director, and the Director's letter of May 12 to Mr. Conlan were distributed at the meeting).

The Board endorsed the Director's previous action in denying a request for the full text of a reviewer's comments on an education project, based on the long-standing practice of confidentiality of comments. The Chairman read portions of previous Board discussions regarding the confidential nature of reviewers' comments, and it was decided that a resolution reaffirming this position should be considered. Such a resolution was drafted, introduced, and after discussion acted upon as follows:

> The National Science Board CONSIDERED the policy extending over the National Science Foundation's history of preserving the confidentiality of comments on grant proposals and the identity of the reviewers making such comments. The Board NOTED that, in addition to its awareness of this policy, the Board had specifically recognized the policy at its Eightieth Meeting on October 20, 1962, and its 146th Meeting on April 20, 1972. The Board also REFERRED to the several National Science Foundation publications of an administrative nature referring to the same policy. The Board unanimously REAFFIRMED that policy.

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[1] The Director's reply of May 16 to Mr. Conlan was sent to the Board on May 19 (NSB-75-183).

ES:173:15

CONGRESSIONAL REVIEW OF GRANTS

Committee on National Science Policy
(from page ES:173:14

A revised resolution concerning congressional review of proposed grants was distributed and discussed, after which the Board acted as follows:

> The Board unanimously ADOPTED the resolution attached as Appendix B opposing H.R. 5796 and Section 7 of H.R. 4723, as passed by the House of Representatives.

ES:173:15

The Board reconvened in Executive Session briefly from which the following action is reported. The Board reaffirmed its long established policy on the confidentiality of the peer review process by adopting the following resolution:

The National Science Board CONSIDERED the policy extending over the National Science Foundation's history of preserving the confidentiality of comments on grant proposals and the identity of the reviewers making such comments. The Board NOTED that, in addition to its awareness of this policy, the Board had specifically recognized the policy at its Eightieth Meeting on October 20, 1962, and its 146th Meeting on April 20, 1972. The Board also REFERRED to the several National Science Foundation publications of an administrative nature referring to the same policy. The Board unanimously REAFFIRMED that policy.

173:22

CONGRESSIONAL REVIEW OF GRANTS

APPENDIX A

RESOLUTION UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD
AT ITS TWENTY-FIFTH ANNUAL (173RD) MEETING
May 16, 1975

The National Science Board opposes H.R. 5796 and Section 7 of H.R. 4723, as passed, that would require proposed grants to be available for 30 days of Congressional review prior to final award.

The proposed legislation has the potential for producing serious weakening of science which has been made strong over the last 25 years by National Science Foundation (NSF) sponsorship of the highest quality and priority research projects. Review of scientific proposals with a goal that the best be selected requires utilization of highly qualified and technical experts able to understand the proposed experiments, the achievability of goals, and the competence of researchers to undertake the proposed investigations. The evaluation and selection process involves an examination of more than 24,000 proposals involving some 1,000,000 pages of technical material each year. The identification of the proposals to be supported has been performed effectively by a competitive system which includes peer review and involves several thousand distinguished experts in the country combined with the studied judgment of the NSF professional staff. Of the hundreds of thousands of grants awarded by the NSF over the years, only a small fraction has been questioned by Members of the Congress and others.

The National Science Board in its role as a policy-making body welcomes the continued oversight of Foundation programs by the Congress. On its part the National Science Board will continue to ensure that the management practices of the Foundation operate to identify and support the best and highest priority research in the country.

The National Science Board strongly urges the Congress to reject H.R. 5796 and Section 7 of H.R. 4723, as passed, in its further consideration of the Foundation's fiscal year 1976 authorization. It is our opinion that the two bills propose to extend Congressional control in too great a detail to be either effective or efficient.

APPENDIX B

NSB-75-182

RESOLUTION UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS TWENTY-FIFTH ANNUAL (173RD) MEETING
May 16, 1975

The National Science Board considered the policy extending over the National Science Foundation's history of preserving the confidentiality of comments on grant proposals and the identity of the reviewers making such comments. The Board noted that, in addition to its awareness of this policy, the Board had specifically recognized the policy at its 80th Meeting on October 20, 1962, and its 146th Meeting on April 20, 1972. The Board also referred to the several National Science Foundation publications of an administrative nature referring to the same policy. The Board unanimously reaffirmed that policy.

RESOLUTION ON PEER REVIEW INFORMATION

The Board ADOPTED the resolution on peer review information proposed by Task Force 75-C as amended by the Board (attached as Appendix D).

Dr. Cobb abstained from voting on the above resolution.

174:9

APPENDIX D

NSB-75-225

RESOLUTION ON PEER REVIEW INFORMATION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 174TH MEETING ON JUNE 20, 1975

The National Science Board has examined the use of peer review in the National Science Foundation decision process on grant awards and declinations. The Board intends the peer review process to aid the effective evaluation of proposals with the fairest possible treatment of each individual proposal and the broadest possible participation of qualified scientists and other appropriate persons. The Board intends that the review process be conducted with as much openness and information to proposers as possible consistent with the effective administration of the decision process. To these ends the National Science Board RESOLVED that:

1. The Foundation will publish annually a list of all reviewers used by each division and office.

2. Program officers should seek broadly representative participation of qualified individuals as reviewers.
3. Verbatim copies of reviews requested by the Foundation after January 1, 1976, not including the identity of the reviewer, will be made available to the principal investigator/project director upon request. The question of including the identity of the reviewer will be considered further by the National Science Board.
4. The Foundation, upon request, will inform the principal investigator/project director of the reasons for its decision on the proposal.

All reviews requested prior to January 1, 1976, will continue to be governed by earlier policies, since those reviews will have been solicited with a commitment on the part of the Foundation to the confidentiality established by that earlier policy.

The National Science Board believes this new policy will serve to improve the information exchange with the scientific community and allow it to understand better the reasons behind Foundation decisions.

174:14

DECLINATIONS OF PROPOSALS

The Director called the Board's attention to NSB-76-11 (distributed at the meeting), "Reconsideration of Declinations of Proposals" with an attachment of a proposed NSF circular outlining procedures for requests for reconsideration of actions on proposals. The Director stated that the Foundation has been subjected to criticism because of the absence of formal procedures whereby a principal investigator whose proposal has been declined can seek review by higher authority. It has become apparent that a more formal procedure for dealing with such reviews is desirable.[1]

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[1] Important Notice No. 61 to Presidents of Universities and Colleges and Heads of Other NSF Grantee Organizations, "Reconsideration of Proposals Declined by NSF," was issued by the Director on January 27.

ES:178:10

AD HOC COMMITTEE ON PEER REVIEW SURVEY--SIXTH MEETING--NOVEMBER 17

Dr. Mac Lane, Chairman, stated that the Committee discussed the status of its survey on peer review. A final draft of the report is expected before the end of November. Since this report is to be jointly issued by the Subcommittee on Science, Research, and Technology (chaired by Representative James W. Symington--D.-Mo.) of the House Committee on Science and Technology and the Board and must be so issued before a new Congress assembles, the Committee recommended that the Executive Committee take final responsibility for its clearance.

> The Board unanimously AUTHORIZED the Executive Committee to approve the issuance of the joint report on peer review survey by the Board and the Subcommittee on Science, Research, and Technology.

The Ad Hoc Committee commented on a draft journal article which summarized the results of the surveys. Some editorial changes to the article were suggested, and Dr. Sanderson was asked to incorporate the changes into the final version.

NSB-77-150

March 30, 1977

POLICY REGARDING PEER REVIEW ENDORSED BY THE NATIONAL SCIENCE BOARD AT ITS 188TH MEETING ON MARCH 17-18, 1977

Responsibility for all award decisions rests with the National Science Board or other Foundation official(s) to whom such authority has been formally delegated. NSF program officers have the responsibility to select those proposals recommended for funding. In fulfilling these responsibilities, peer review is one of the most important sources of information and advice about proposal quality. The policy regarding peer review described here is intended to make the award decision process as fair, effective, open, and efficient as possible, recognizing that in some cases there may be conflicts among these objectives. It includes earlier decisions made by the Board on this subject and provides additional guidance, particularly in documenting and reporting on the peer review process and its use.

I. It is the policy of the National Science Foundation that the evaluation of all formal proposals for NSF funding includes external peer review with the following exceptions:

  A. Proposals submitted in response to formal solicitations that are governed by the Federal Procurement Regulations.

  B. Proposals to provide goods or services normally obtained through purchase orders or requisitions.

  C. Other proposals for which peer review has been waived by the Director or his designee. A report on the use of this category of exception must be included in the Director's periodic report to the Board on the award decision process. Some classes of proposals may be excepted categorically, such as travel grants, committed renewals, etc.

  D. Proposals which are withdrawn prior to decision.

II. Peer review generally takes the form of ad hoc or mail reviews; reviews by an assembled panel of peers; or a combination of the two. Each program shall select one primary method for peer review which will represent the minimum review received by proposals in that program. This primary method of peer review can be supplemented with additional reviews, site visits, etc., as needed for individual proposals or activities.

After approval by the Director or his designee, the primary method of peer review in each program, including the evaluation criteria reviewers are requested to consider in reviewing proposals, shall be suitably announced.

III. The peer review process is intended to aid in the effective evaluation of proposals and to assist in assuring that each proposal receives full and fair consideration. Selection of reviewers shall be made in accordance with criteria established to accomplish this objective. Factors to be considered in the selection of reviewers include an appropriate representation of relevant skills, viewpoints, and backgrounds needed to evaluate each proposal. To the extent practical, reviewers should be selected to obtain a wide representation of reviewers in terms of geographic distribution, type of institution represented, race and sex of reviewers, etc.

IV. Principal investigators shall be informed by the Foundation of the availability upon request of: (A) verbatim, unsigned copies of all peer reviews; (B) the criteria established for the review; and (C) a summary of the Foundation's reasons for its decision on the proposal.

V. In no case is a review to be associated with an individual panel member, a reviewer (panel or ad hoc), or subgroup of an entire panel, except as required by law. Names of ad hoc reviewers are confidential and are not to be released except as required by law or as provided in VI. below.

VI. The Director shall provide the Board no less than annually a report on the Foundation's use of peer review. This report shall include:

A. A published list, by Division, of all reviewers used during the preceding year.

B. Information on the waiver of peer review for proposals under Section I.C.

C. Statistical analyses of the use of peer review.

D. Recommendations for change or further consideration of the Foundation's policies on peer review.

E. Such other information as the Director may feel appropriate.

Criteria for the Selection of Research Projects by the National Science Foundation

As approved by
the National Science Board
at its 167th Meeting
October 17-18, 1974, and
amended at its 192nd Meeting,
August 19, 1977, and its 203rd Meeting,
January 18, 1979

SUMMARY

The National Science Foundation (NSF) administers several different programs of research support corresponding to several legislatively assigned objectives. To the maximum degree possible, these activities are designed to utilize and enhance existing scientific research potential and institutions. Purposeful adjustments are made when indicated.

In the selection of individual projects a number of widely understood and acknowledged criteria are considered. In different programs, the different criteria must be assigned different weights, according to the objectives being pursued. Also these criteria relate in different ways to the distinctive characteristics of different types of research-performing organizations.

INTRODUCTION

Policy Context

Public support of scientific research, specifically including *basic* research, is an accepted feature of United States public policy. Such support has two recognized major objectives:

- To foster and maintain basic research as an investment toward future opportunities, as insurance against unforeseeable future dangers, and as a vital element of culture;
- To bring about prompt, effective performance of applied research and problem-oriented basic research—insofar as specific needs for these can be foreseen in the light of current understanding.

The National Science Foundation

It is not possible to make the distinction between basic and applied research a sharp one, and the Foundation is one of several Federal agencies that supports research of both kinds. The Foundation, however, is unique in its mission to foster basic research *per se* and in its responsibility for future scientific research capability. Thus the National Science Foundation Act of 1950, as amended, authorizes" programs to strengthen scientific research potential" as well as "scholarships and graduate fellowships." The Act authorizes support both of basic and of applied research and—in combination with Presidential directive—use of an unrestricted range of performers.

Agency Objectives and Methods

The Foundation thus has been charged with advancing several different but interrelated major objectives:

- Accomplishment of basic research;
- Accomplishment of applied research in selected areas;
- Long-term maintenance and strengthening of potential to accomplish both basic and applied research in the future.

This range of objectives has been reflected in the development of several different program formats for NSF support of research. But despite the approximate correspondence of programs to objectives, it remains true that research support actions are often taken with more than a single end in view. Thus, the Foundation's method of pursuing any one objective may be modified or restricted by consideration of the others.

Functions Performed

Where research support is concerned, functions performed by the Foundation include:

- Allocation of resources to fields of science, to classes of scientific activity, or to areas of applications;
- Selection of individual projects to be supported;
- Direct establishment or adjustment of institutional structures or capabilities.

CRITERIA

Allocation of resources to fields of science and to areas of application is not further discussed in this notice, but many of the criteria for individual project selection require only slight modification for use at the higher levels of aggregation. Criteria for the creation or modification of institutional structures are dealt with in a separate section.

The following is an enumeration of criteria employed in the selection of research projects. To simplify later discussion, they are grouped in four categories.

Category A

Criteria relating to creative performance of research—the technical ability of the performer and adequacy of the institutional base:

1. Potential for future accomplishment by the scientist, based on the recent record of performance, experience, and training;
2. Demonstrated awareness by the scientist of previous and alternative approaches to the problem;
3. Adequacy of available or obtainable instrumentation, preparatory data, and technical support for the scientist.

Category B

Criteria relating to the internal structure of science itself:

4. Probability that the research will lead to important discoveries or significant con-

ceptual generalizations within its field of science and, in most favorable cases, extending to other fields as well;

5. Probability that the research will lead to significant improvements or innovations in investigative methods within its own field and possibly in other fields of science.

Category C

Criteria relating to utility or relevance to national objectives:

6. Probability that the research can serve as the basis for new inventions or improved technology.
7. Probability that the research will contribute substantially to technology assessment—i.e., to assessing or predicting the direct and indirect, intended and unintended, effects of existing or proposed technologies;
8. Identification of an immediate programmatic context for, and user(s) of, the anticipated research results;
9. Probability that the research will assist in solving societal problems, in improving the knowledge base for national policies requiring science and technology, or in furthering the interests of international cooperation in science.

Category D

Criteria relating to future and long-term scientific potential of the United States:

10. Probability that the research will positively influence the capabilities, interests, and careers of participating graduate students, postdoctoral associates, or other junior research workers;
11. Probability that the research will contribute to a tradition of excellence in the field;
12. Anticipated effected upon the institutional structure of U.S. science;
13. Probability that funds allocated for the research will aid the effort to avoid undue concentration in any region of the Nation.

Because none of these considerations is susceptible to precise quantification, or even in most cases to unambiguous rank ordering, it would be more accurately descriptive to speak not of "criteria" but rather of "factors considered." Moreover, very different relative weights must be attached to the different factors in the case of different agency objectives or programs, as is explained in a later section.

Discussion

The first three criteria—those relating to creative execution—are considered in every program. Every NSF-supported research project is expected to produce some valid new information or relationships. The best way to ensure this is to insist upon competent scientists and adequate facilities. The considerations which follow then are predicated upon the assumption that these first three criteria are met and that competent performance will be the minimum expectation.

Criteria 4 and 5—those relating to the internal structure of science—summarize succinctly what the scientific community understands by the phrase "intrinsic scientific merit."

Criteria 6 and 7—those relating to utility or relevance—in many cases may be considered to be met by Criteria 4 and 5, since science judged best by internal standards usually turns out to be the most useful. Research is properly termed "applied" when the results can be used in a very specific context, often defined in terms of some already formulated systems concept, or when they prove diagnostic of some already recognized problem. The specific relationship of applied research to a particular systems concept and plan of development is made still more explicit in Criterion 8. Criterion 9 suggests the importance of basic and applied research to the attainment of goals in public policy.

Criteria 10, 11, 12, and 13—those relating to long-term scientific potential—address not so much the content of the research as the circumstances under which it is performed. They include the quality of training for scientists, but extend beyond to the processes of scientific communication and publication, the evolution of scientific disciplines, the encouragement of interdisciplinary cooperation, the manner in which scientific careers are developed, the organizational structures and settings in which all this goes on, and in general how the scientific tradition of our Nation and the capabilities of our scientists and engineers are maintained. While these factors are seldom dominant in project selection or program development, they are always considered.

GUIDELINES FOR APPLICATION TO SPECIFIC TYPES OF PROGRAMS

While the first three criteria are vigorously applied in all research programs and the last four are always kept in mind, the importance of the remaining criteria varies as a function of program emphasis. To illustrate:

Basic Research

In these programs the focus is strongly on potential performance (Criteria 1, 2, and 3) and intrinsic scientific merit (Criteria 4 and 5). Some consideration is given to utility (Criteria 6 and 7), not on a project-by-project basis, but rather in determining levels of effort to be applied to entire fields and subfields of science. Consideration also is given to broadening geographic distribution of research capability, as well as to preserving and enhancing the positive characteristics of proven successful institutions. In the case of large-scale coordinated basic research efforts, often including logistic components and requiring special planning and management, somewhat greater consideration is given to organizational and institutional influences of the project (Criterion 12).

Applied Research

For programs of this variety, utility and relevance to national objectives are of paramount importance (Criteria 6 to 9). These criteria are considered during assessment of every proposal with particular stress on improving technology, technology assessment, and policy analysis (Criteria 6 and 7). Scientific merit and long-term scientific potential, the factors of greatest importance to basic research, are never neglected when assessing applied research proposals. The distinction, in fact, between applied and basic research becomes blurred in many instances. The so-called "open window" projects (smaller scale unsolicited applied research projects that offer new approaches to problems defined by the investigators) are examples in this borderline area, as are many engineering and social sciences projects. Correspondingly, the balance among criteria changes to accommodate this sort of situation.

Research Applications

In these user-focused programs (as distinct from applied research which is problem-focused), the clear identification of utility and users matters most (Criterion 8). Other criteria dealing with technology improvement and relation to national objectives also receive strong attention (Criteria 4, 6, and 7). As usual scientific merit is of concern, but with different values attached, since applications work may proceed predominantly or totally from already accomplished basic and applied research.

Policy Research

Competent performance and scientific merit are essential components of these types of programs. Emphasis is, however, also placed on relevance to national objectives and usefulness (Criteria 6, 7, and 9).

Education Research Programs

Relevance to national objectives, improving the quality of life, and solving societal problems are fundamental considerations in the research programs that focus directly on the educational processes of the country (Criteria 6, 7, and 9).

SPECIAL GUIDELINES FOR ORGANIZATION AND RESEARCH ADMINISTRATION

In certain instances, such as initiation of National Research Centers and other large-scale coordinated research efforts, additional guidelines must be applied. These guidelines, given below, reflect needs for greater intervention and responsibility on the part of the Government and decisions at higher levels of aggregation.

Criterion of Need

Evidence should exist, if a new administrative structure is proposed, that it is needed to address scientific problems in a manner or on a scale not possible with existing structures.

Criterion of Long-Range Potential

Evidence should exist of a mission with such potential for high scientific productivity over an extended time period that a significant number of excellent scientists are willing to commit their careers to it.

RELATIONSHIP TO SOME CHARACTERISTICS OF RESEARCH-PERFORMING ORGANIZATIONS

NSF policy is to use and reinforce proven strengths of U.S. scientific institutions. These institutions include organizations of different types, such as:

- Universities and colleges;
- Industrial research laboratories or organizations and in-house laboratories of Federal agencies;
- National Centers and other federally funded research centers;
- Vendors of R&D services.

The Foundation seeks to avoid inadvertently changing the characteristics of proven organizations—either through individual actions, or as the cumulative result of many actions. Purposeful changes may occasionally be encouraged for specific reasons. Some relevant characteristics of the different types of organization include the following:

- Universities and colleges (academic institutions proper) have as their two principal missions teaching and the development and propagation of new knowledge and understanding. As applied to these organizations, therefore, Criteria 9 and 10 may be regarded as criteria of "mission relevance."
- Academic organizations, traditionally, are deeply committed to considerations of intrinsic scientific merit (Criteria 4 and 5) in developing and selecting their own research programs. This is largely a consequence of peer evaluation and peer pressure exerted upon the individual scientist.
- Organization along disciplinary lines is a prominent feature of academic research tradition. This is an indispensable virtue insofar as it guarantees comprehensive peer evaluation of scientific research *results*, but it presents some limitations for problem-oriented research. It should be borne in mind that new disciplines emerge from time to time and that the focus of established disciplines evolves continually.
- Academic environments also tend to place extreme value upon originality, methodological elegance, and upon the initiative and scientific judgment of the individual investigator. This characteristic again presents some limitations for problem-oriented research.
- Industrial research laboratories or organizations and Federal agencies' in-house laboratories generally have as their mission the generation of new knowledge and understanding in areas judged to be of immediate or potential concern and use in carrying out the commercial activities of the parent company or the mission of the agency.
- National Centers and federally funded

research centers have as their mission the generation of new knowledge and understanding judged to be needed or desirable in the public interest. These organizations are generally established to provide specialized research environments not readily obtainable in organizations of the other types.

- Vendors of R&D services include many of the "not-for-profit" R&D organizations and also a number of—usually more specialized—R&D companies. These organizations, in addition to maintaining some level of independent research, are unique in the extent to which they undertake contract research on topics and problems designated by outside purchasers. Collectively they constitute a reservoir of general purpose research capability.

Discussion

Different factors tend to determine the scope and complexion of the research programs in the different types of organizations. Thus, universities tend to be complement limited. For them, the primary management decision is how many professional staff (faculty) to employ and which particular ones. Subsequently, these individuals determine program content. Industrial and mission agency in-house laboratories are "mission determined." That is, activity is weighed and selected according to mission requirements. Finally, R&D vendors are, at least to some extent, capability and market limited. Foundation policy is to recognize and, generally, to avoid disturbing these characteristic differences.

PROPOSED GROUP RESEARCH GRANTS

Dr. Slichter reported that the Committee on Role of NSF in Basic Research proposed an activity to be known as "Group Research Grants" (NSB-77-369--Members' Books, Tab E) to replace the present Coherent Area Grants. This new administrative mechanism was an outgrowth of the Board's discussion of the proposed Departmental Research Centers Program at its meeting on November 19, 1976. 1/

Dr. Slichter stated that the term Group Research Grants describes a research project which would combine into one administrative mechanism several projects which ordinarily would be viable if supported separately. A single scientist would assume primary responsibility for the administration of the project and the negotiations with the supporting agency. Dr. Slichter emphasized that Group Research Grants are intended to support the research of groups of scientists who themselves judge that the effectiveness of their research would be enhanced by group funding. NSF would, through the use of the usual review mechanism, apply the same standards and criteria to the individual parts of a group proposal as apply to single investigator proposals. Only those parts of a group grant that meet NSF standards would be funded. The group awards would be in direct competition with individual project grants.

Dr. Slichter indicated that the proposed Group Research Grants will be responsive to certain issues raised by the proposed plan for support of Departmental Research Centers. These included the erosion of quality of some of the best scientific research groups, problems in the support of young investigators, upgrading and replacing old equipment, need for technical and support staff, and support for new initiatives. He mentioned also that the term "department" in the original plan was considered by the Committee to be unduly limiting.

Dr. Slichter continued by describing two problems the Committee felt might be encountered with Group Research Grants. These were (a) how to relate funds which might go to a research group under the Group Research Grants with other funds the departments might have from project grants, and (b) the issue raised by having a small number of large grants of highly visible character. Another concern was that the group mechanism might lead to lower award standards since investigators from all disciplines could conceivably compete for funding in an operation administratively separate from the current NSF procedures for making quality decisions. Both the project description and the policy statement proposed for Group Research Grants include words intended to thwart this.

Dr. Slichter reviewed in some detail background information on the Committee's development of the present proposal and acknowledged the close cooperation of NSF staff, particularly Dr. Marcel Bardon, Dr. Fregeau, Mr. Claud Kellett, and Dr. M. Kent Wilson, in the preparation of the following material presented to the Board (Members' Books, Tab E):

"I. Group Research Grants"--A description of the proposal and an explanation of the criteria to be used in making the awards (NSB-77-365).

"II. General Policy for Administration of Group Research Grants"--A statement of the policy proposed for the administration of Group Research Grants (NSB-77-366).

"III. Resolution Approving the Group Research Grant Concept and the Policy of Administration" (NSB-77-367--Revised).

"IV. Resolution Endorsing Group Research Grants to Maintain Excellence in Science" (NSB-77-368--Revised).

1/ As recorded in the minutes of that meeting (NSB-76-440, Appendix B).

NSB-78-52

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 195th MEETING ON JANUARY 19-20, 1978, on the Experimental Program to Stimulate Competitive Research

The National Science Board APPROVED the Experimental Program to Stimulate Competitive Research and the general guidelines for its management as submitted to the Board in NSB-78-12, except that the proposal on page 3 to rank order the eighteen states by their cumulative performance on indices is not to be regarded as essential to these guidelines, and AUTHORIZED the initiation of the Program.

January 31, 1978

Dr. Slichter distributed at the meeting the revised versions of Resolutions III and IV which the Committee developed as a result of suggestions made by the Programs Committee at its meeting with Dr. Slichter on September 14 and the Committee's own deliberations at its meeting on September 15.

A general discussion of the proposed activity followed including a question as to whether the Materials Research Laboratories (MRL's) would be affected if the Coherent Area Grant were replaced. The response was that MRL's are under separate policy guidance approved by the Board and would not be affected.

Another query was whether there was a need for Group Research Grants, since the Foundation's present procedures permit the making of grants to any group of investigators who submit a proposal. Dr. Slichter responded that this new mechanism would provide a substantial clarification of the Foundation's willingness to receive group proposals from the community. It was further decided that the activity was not a new program as such, but rather an administrative mechanism for a designated purpose.

In the discussion of the resolutions, the Committee agreed to withdraw Resolution IV on the Director's suggestion that he would ask the new assistant directors to review the Foundation's activities to ensure that the level of support of the best groups is adequate for their effective functioning. The Director agreed to report back to the Board at an early date.

With minor editorial changes in the revised Resolution III, the Board took the following action on the resolution proposed on August 30 in NSB-77-367 (Revised):

> The Board APPROVED the category of multiple investigator support entitled Group Research Grants as described in NSB-77-365, the general guidelines for its management as submitted to the Board in NSB-77-366, and the announcement of the Foundation's willingness to consider proposals of this type.

Dean Meckling abstained from voting on the above resolution.

Following the vote on Group Research Grants, the Chairman expressed the appreciation of the Board to Dr. Slichter and the Committee on Role of NSF in Basic Research for its work in developing the proposal for group support.

PROPOSED CHANGES IN "CRITERIA DOCUMENT"--GUIDELINES FOR SELECTION OF PROJECTS

The Board discussed the recommendations of the PPC on the revisions to Criteria for the Selection of Research Projects by the National Science Foundation as contained in Section 6 (NSB-78-498, Members' Books, Tab L) and the following changes to Criteria 1 and XIII:

a. Under Category A--Criteria relating to creative performance of research--the technical ability of the performer and adequacy of the institutional base:

   I. Potential for future accomplishment by the scientist, based on the recent record of performance, experience, and training.

b. Under Category D--Criteria relating to future and long-term scientific potential of the United States:

   XIII. Probability that funds allocated for the research will aid the effort to avoid undue concentration in any region of the Nation.

The Board then acted as follows:

NSB/Res-79-5 The Board unanimously ACCEPTED the recommended changes to the Criteria for the Selection of Research Projects by the National Science Foundation.

203:24

CREATIVITY EXTENSIONS OF AWARDS

On the basis of a recommendation of Discussion Group 79-C, "The Adequacy of Funding Mechanisms," the staff has developed an award mechanism entitled "Creativity Extensions" as a procedure to stimulate innovative research ideas.

The Deputy Director reported that he had received some comments on prospective plans for this plan. The suggestions have been included to the extent possible in the revised document distributed to the Board (NSB-79-293).

The plan would authorize a program officer, at the end of the second year of a three-year continuing grant, to extend a grant an additional two years beyond the expiration of the original continuing grant without the submission of a formal proposal or additional peer review. The extension would be based on especially creative research accomplished during the preceding two years.

During the discussion it was recommended for staff consideration that this plan be extended to include principal investigators who had three successive grants or successive grants amounting to three years. It was also noted that this arrangement will not be sufficient to detect the potentially creative proposals which do not readily fit into the confines of a particular field.

The plan was amended, at the suggestion of the Executive Committee which reviewed it at its meeting on August 2, to include among other items the stipulation that Assistant Directors shall report annually to the Director and the Board on the extent of use of creativity extensions in their directorates.

Since the plan is a change in administrative procedures, it did not require Board approval.

208:10

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

nsf

OFFICE OF THE
DIRECTOR

NSB 80-140

March 26, 1980

MEMORANDUM TO: MEMBERS OF THE NATIONAL SCIENCE BOARD

Subject: Changes in Peer Review Procedures since June 1975

In compiling information for COSPUP on how the Foundation's peer review procedures have changed in the past five years, it occured to me that you would be interested in seeing the changes in this summary form.

Richard Atkinson
Richard C. Atkinson
Director

Enclosure

P.S. Board members present at the June 1975 meeting in La Jolla will find this list particularly interesting. That meeting was quite spirited and much of the discussion centered on item 3 of the attached list.

Summary of Changes to NSF Peer Review Procedures since June 1975

In chronological order, the important changes which have been made in peer review procedures since June 1975 are as follows:

1. Expeditious Proposal Processing: Policy requiring review and decision on all proposals within nine months of receipt was established by O/D 75-51 on November 17, 1975. Exemptions may be made by the cognizant Assistant Director for sufficient cause. This policy is now stated in Circular 138 (October 1, 1977).

2. Reconsideration: A formal process for reconsideration of declined proposals was established in January 1976. It provides for a three-stage procedure involving explanations by the responsible program officer, reconsideration by the cognizant Assistant Director, and, at the request of the principal investigator and the President or Chief Executive Officer of the applicant institution, a further reconsideration by the Deputy Director. This policy was first promulgated in Important Notice 61, and is currently stated in Important Notice 76 and Circular 127 (Revision 1, October 2, 1979).

3. Verbatim, anonymous reviews: In early 1976, NSF established the policy of providing principal investigators, on request, with verbatim copies of all peer reviews of their proposals. These copies are provided without identifying the reviewer or the reviewer's institution. They are furnished only to the principal investigators, not to administrators or other persons. Circular 132 (Revision 1, February 9, 1979) states this policy, which was originally promulgated by O/D 76-10, dated February 13, 1976.

4. Guidelines to Program Officers: Specific guidelines for managing the peer review process, which implement criteria adopted by the National Science Board, were provided to program officers in O/D 76-11 on February 15, 1976. They are currently stated in Circular 132 (Revision 1, February 9, 1979).

5. External Program Oversight: In April 1977, following extensive discussion with the National Science Board, the Foundation initiated external oversight of programs. The policy requires that each program be reviewed at least once every three years, using existing advisory committees supplemented as necessary by experts. A sample of proposal and grant files is selected, and an assessment made of the adequacy of the reviews, the appropriateness of the reviewers selected, the adequacy of the documentation and justification of the decision to fund or decline, and the overall scientific quality of the projects supported. Circular 147 (January 17, 1979) currently states this policy, which was first established by O/D 77-17 (April 27, 1977).

6. Office of Audit and Oversight: The establishment of the Office off Audit and Oversight was announced on September 16, 1977, by O/D 77-41. In addition to general audit responsibilities, this office is charged with ensuring that peer review procedures are properly followed throughout the Foundation.

7. Conflict of Interest: Specific guidance on the handling of conflict of interest by NSF staff and by peer reviewers is contained in Circular 139 (January 9, 1978). The policy requires that program officers and peer reviewers dealing with proposals indicate that they have no academic affiliation or financial interests which might bias or appear to bias their decisions, or identify such connections if any exist.

8. Exemptions from Peer Review: Certain proposals are appropriately peer reviewed by special procedures or exempted from peer review entirely. Specific policy concerning such cases was established by O/D 78-9 on February 22, 1978. It is currently stated in Circular 132 (Revision 1, February 9, 1979).

9. Recent Scientific Accomplishments of the Principal Investigator: Policy stated Sept. 1, 1978 in O/D 78-23 now requires peer reviewers to consider both the scientific quality and importance of the proposed research, and also the capability and creativity of the principal investigator as evidenced by recent accomplishments. Both factors are to be considered by the peer reviewer and by the program officer in reaching a decision. Other evidence of capability is examined in the case of younger scientists. The policy is currently stated in Circular 132 (Revision 1, dated Feb. 9, 1979).

10. Fifteen Page Limit: Since 1978, the Foundation has required that research proposals not exceed 15 pages except in special circumstances. This policy seeks to reduce the paperwork burden on both proposers and reviewers. It is stated in Grants for Scientific Research (NSF 78-41A, August 1978), and was officially announced by O/D 78-23 on Sept. 1, 1978. Circular 132 (Revision 1, February 9, 1979) is the current reference.

11. Multiple Grants to a Principal Investigator: The requirement that each proposal jacket contain a listing of all other Foundation proposals or awards with which a principal investigator is involved was established by O/D 78-28 in October 11, 1978. This information allows the program officer to assess the possible effect of other NSF commitments on a proposed project.

12. Creativity Extensions: A recent change to policy, implemented on a trial basis, allows program officers to extend existing three-year continuing grants two years without additional peer review when there is evidence of outstanding creativity. No more than ten percent of existing three-year grants in any program may be so extended. The purpose is to allow the most effective scientists additional freedom to tackle adventurous "high risk" research questions. This policy is stated in O/D 79-36, issued December 6, 1979.

COMPETITIVE PROCUREMENT PROCESS

COMPETITIVE PROCUREMENT PROCESS (NSB-73-237--distributed at the meeting)

Dr. Hackerman reported that the Programs Committee considered and recommended the approval of suggested changes in procedure for obtaining Board approval of awards resulting from the competitive procurement process. Of the approximately 50 contracts expected to be awarded in fiscal year 1974 under the competitive selection procedures prescribed in the Federal Procurement Regulations, it is estimated that ten would require Board approval as required by the NSF Act of 1950, as amended. To avoid undue delay and to follow standard contractor selection procedures in the award of such contracts, the staff made the following recommendations:

(1) Except as provided in paragraph (2) below, all proposed Requests for Proposals (RFP's) or other solicitations, where the awards are expected to require Board approval, will be submitted to the Board for review of the work and estimated cost prior to their release to proposers.

If the RFP or other solicitation is approved by the Board, such approval will constitute Board approval to the Director or his designee to enter into the contract or other arrangements resulting from the approved solicitation. All such awards will be specifically identified for the Board at the next meeting following the award.

(2) In exceptional cases, where time is of the essence, RFP's or other solicitations, which would be subject to the provisions of paragraph (1) above, may be issued prior to Board review subject to the approval of the Director or his designee and provided that the RFP or solicitation be submitted to the Board for review prior to award and the provisions of paragraph (1) above otherwise are followed.

Dr. Hackerman reported that the possibility of a conflict of interest problem arising regarding premature release of RFP information had been considered by the Programs Committee. It therefore recommended Board approval of the proposed resolution with the addition of a reporting requirement. It was also proposed that the Board reevaluate this procedure after a year of operation: (1) to reexamine time pressures; (2) to determine whether any protests or General Accounting Office investigations had occurred; (3) to determine whether the procedure was expeditious; (4) finally, to review the criteria used by the Foundation for the RFP procedure. With those caveats, the Programs Committee recommended Board approval of the resolution.

> With respect to programs previously approved by the Board, the Board unanimously AGREED to consider for approval projects as described in Requests for Proposals or other solicitations prior to selection of awardees; further, the Board APPROVED the making by the Director of a grant, contract, or other arrangement to an awardee(s) selected in accordance with the laws and regulations governing competitive procurement.

The above resolution was approved with the understanding that: (1) such RFP's or other solicitations will be made public without delay after the approval of the Board; and (2) the procedures approved by this resolution will be reviewed after a year of operation under this authority.

158: 16-18

ACCOUNTABILITY IN FUNDING

OMB CIRCULAR NO. A-21

Dr. Massey noted that several people have contacted him concerning the effects of the recent revisions to OMB Circular No. A-21 with respect to the changes in computing indirect costs. He noted that, in fields which have high equipment utilization, the current computation of indirect costs has the effect of reducing the amount of money that goes directly into research. Dr. Mac Lane stated that he has received similar complaints from a number of scientists. He noted that it is his understanding that the previous version of No. A-21 based overhead on salaries and wages, while the present version bases overhead on adjusted total cost.

The Director stated that NSF does not have an official role in the preparation of these guidelines, but does have an advisory role. He noted that several years of discussion among many interested parties preceded the recent changes in this circular.

212:14

OMB CIRCULAR NO. A-21

The Chairman informed the Board that Dr. Mac Lane had requested that the Board discuss at this meeting the Office of Management and Budget (OMB) Circular No. A-21 (Revised). The Chairman referred the Board to a memorandum from Dr. Mac Lane entitled "OMB Regulations on Time Records for Faculty Members" (NSB-80-61 dated February 11--Members' Books, Tab C).

Dr. Mac Lane led the discussion by stating that his concern is with the new requirement for accounting for 100 percent of faculty time. This requirement applies to all individuals at colleges, universities, and nonprofit organizations engaged in Government sponsored projects. The revised OMB regulation allows two different systems to effect this accountability, both of which involve a 100 percent requirement. Dr. Mac Lane stated that in his opinion this requirement creates problems for the educational institutions, the principal one being that the 100 percent accountability then covers many university activities not supported by the Government, and thus are inappropriate for inclusion in the report to the Government. In the opinion of many, including himself, making a percentage accounting of time devoted to each research and teaching activity is fundamentally meaningless because these activities in universities overlap in an intricate fashion that cannot be accounted for by any percentage. Finally, this sort of accounting procedure is all inclusive and is not connected to the individual project involved. Dr. Mac Lane stated that for these reasons (which are elaborated on in his memorandum) he believes the accounting procedures required by the current version of A-21 are unfortunate. Since they affect the research funded by NSF, Dr. Mac Lane recommended that there be renewed consideration of this issue and that a new plan be prepared to meet the needs of accountability yet to avoid abuses, without requiring percentage-of-time accounting for academic staff. Possibly the OMB should be requested to reconsider its position.

The Chairman stated that a number of people had written him concerning this issue. He gave a brief summary of the background on the revision of A-21, noting that it was under consideration for several years before publication of the present version. An earlier version of A-21 was anathema to the university community; it has since been altered at least to the extent that there has been a rearrangement of the indirect cost allocations which distributes them on modified total direct costs instead of concentrating them on wages and salaries, as had been the case in earlier versions of the circular. The result has been that those grants which are people-intensive will carry a higher indirect cost rate than those which are equipment-intensive. He noted that, while this is a different issue, he believes it was settled to the satisfaction of most of the academic community.

Dr. Hueg commented that there is no question that this accountability requirement has caused distress on the part of researchers. At the University of Minnesota there was a great deal of discussion in the Senate Research Committee about the revision of A-21, but no alternative was suggested. In his opinion the final decisions on the changes to A-21 were made by the business officers who may have a different perspective than faculty members. It would be difficult to effect any major change in A-21 now.

Dr. Mac Lane remarked that Dr. Hueg had identified a key aspect; i.e., that the present version of A-21 is the result of extensive negotiations between OMB and primarily the business officers at the universities. It is not clear that the interests of all parties were represented in these negotiations. Some academic scientists believe that these reporting requirements, developed without full consultation, deprive them of their traditional independence and will hamper innovative research.

Dr. Hubbard commented that he was supportive of Dr. Mac Lane's concerns, but felt that there was a broader and more fundamental issue to be addressed. This issue is how one is to be accountable when support of salary is received from several institutions, each of which has a different defined purpose. In his opinion multiple source funding of faculty salaries will be useful and appropriate. How one accounts to several institutions that provide that disparate support will continue to be an issue. Dr. Hubbard stated that there is a need to recognize this is a legitimate long-standing issue that needs to be resolved. He noted that the revision of A-21 is simply that; it should not be looked upon as either the origin of the concern or the beginning and end of the response to it.

The Director stated that, in response to this discussion of issues concerning A-21, he did not feel any decisions could be made immediately. Preferably, the university community would have coordinated a response before the regulation was formulated. He did state, however, that this might be a subject where a special commission, as provided for in the Organic Act, might be appropriate. He cautioned, however, that this would be a major undertaking which would have to be agreed to by OMB before it was started.

Dr. Mac Lane stated that there is a possible input from the National Commission on Research. Individuals at the Commission have stated to him their intention to issue a report with recommendations on accountability. It had been suggested that Dr. Cornelius Pings, Director of the Commission (Vice-President for Research, California Institute of Technology), might at some appropriate time present some of the findings and recommendations of the report to the Board. The Director noted that Dr. Pings has communicated with some of the NSF staff and has discussed these matters with the Congress. The Director would be agreeable to having the Committee on Role of NSF in Basic Research consider this issue.

Dr. Cota-Robles stated for the Board's information that the Univesity of California has prepared a position paper on accountability which it presented to OMB with the endorsement of the American Association of Universities.

The Chairman concluded the discussion by stating that he would take this subject and the issues presented under advisement and would suggest to the Board later any action that might be taken to address these issues.

OFFICE OF MANAGEMENT AND BUDGET (OMB) CIRCULAR NO. A-21 (Revised)

The Board Chairman informed the Board that Dr. Mac Lane had requested an opportunity to discuss further OMB Circular No. A-21 and call attention to his memorandum on this subject (NSB-80-161--Members' Books, Tab D).

Dr. Mac Lane led the discussion by providing a background summary of some of the problems associated with OMB Circular No. A-21 (Revised) which were discussed by the Board at its February meeting. He informed the Board that since that meeting he had conducted investigations on A-21 by consulting with NSF staff, Dr. Frank Press, several officials in other Government agencies, members of the National Commission on Research (NCR), and members of the faculty and administration at several universities. He referred the Board to his memorandum which explained the problems associated with A-21 and which also contained two proposals for their solution from NCR's report: Accountability: Restoring the Quality of the Partnership. A discussion ensued in which it was agreed that appropriate accountability for the use of Government funds to support scientific research was requisite and proper, but that the proposed form of accountability required by A-21 was impracticable; hence, viable alternatives for suitable accountability need to be considered.

Dr. Mac Lane stated that he had drafted a proposed resolution on A-21 which he distributed to the Board for its consideration. He noted that the thrust of the resolution was for the Board to request OMB and other Federal agencies concerned to reconsider the provisions of A-21 and provide other options for suitable accountability. The Board discussed the proposed resolution and agreed that the problem could not be resolved without offering specific alternative means of accountability. It was agreed that A-21 would be discussed further at the May meeting.

215:14.

OFFICE OF MANAGEMENT AND BUDGET CIRCULAR NO. A-21
(continued from page 216:17)

The Acting Board Chairman called on Dr. Mac Lane to present his edited proposed statement (distributed at the meeting). The Board briefly discussed the language in the statement which contained the principal recommendation that the rules as to compensation for personal services be temporarily suspended to allow for consideration of various alternatives. The Board also discussed the most effective means to transmit the Board's views on this subject to the pertinent officials. Following this discussion the Board acted as follows:

NSB/Res-80-50 The Board unanimously ACCEPTED the proposed statement as its position on OMB Circular No. A-21 and AGREED that this statement would be incorporated into a letter to be transmitted to the Director of OMB by the Board Chairman on behalf of the Board. 1/

216:24

1/ A letter dated May 16 from Dr. Branscomb to The Honorable James T. McIntyre, Jr., Director, OMB, was delivered on May 21, and is attached as Appendix D.

APPENDIX D
(Attached to
NSB-80-241)

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

May 16, 1980

Honorable James T. McIntyre, Jr.
Director
Office of Management and Budget
Executive Office Building
Washington, D.C. 20503

Dear Mr. McIntyre:

The National Science Board is aware that the need for improved accountability for public funds expended in educational institutions has resulted in an effort over several years to revise the Office of Management and Budget (OMB) Circular No. A-21. Many representatives of educational institutions have been given the opportunity to express their views. Given the accounting and administrative complexities of this issue, the National Science Foundation and the Board have not been heavily engaged in a study of it.

Recognizing that the new procedures are slated to go into effect in the very near future, the Board would not wish to inject itself into this issue had we not become aware in recent months of a widespread concern on the part of faculty investigators that the new procedures will have unanticipated negative effects on the environment believed necessary for productive research.

Accordingly, the National Science Board has asked me to convey its suggestions concerning the revised OMB Circular No. A-21 "Principles for Determining Costs Applicable to Grants, Contracts, and Other Agreements with Educational Institutions." Some of these principles can have major effects on the support of scientific research, and hence are of direct concern to the National Science Board. This is particularly the case with the Section J-6 of Circular No. A-21 dealing with "Compensation for personal services" by the method of "monitored workload" or "personnel activity reports." Either of these methods requires 100% accounting of the work (or activity) of faculty members and other scientists in universities. Many scientists, though happy to account for their use of Government funds, regard such numerical accounting as counterproductive because of the intricate way in which teaching, research, and administration interlock in the university setting. Many scientists tell us they believe that such accounting will produce conflicts and misunderstandings and may in some cases discourage the independence required for research.

OMB interpretation of this circular indicates that these rules would include accounting for teaching loads (such as changes in the number or level of courses taught); most university teachers would consider that this is not a suitable concern of the government. Because of these opinions, the Board concludes that this particular version of accounting for personal services may be unwise, and that it could diminish the effectiveness with which government funds are used to support research. The National Science Board, therefore, respectfully requests that OMB and the other agencies concerned reconsider these provisions of Circular No. A-21.

The Board suggests that the provisions at present represent the "procurement" approach, rather than the "assistance" approach more suited to the research to be supported by National Science Foundation grants.

As initial steps, the Board suggests that the rules as to compensation for personal services in the new Circular No. A-21 be temporarily suspended, so that during the suspension different institutions can propose and use various alternatives, as a test. The Board also suggests that the ultimate rules as modified might well allow more such flexibility for institutions. Also, for purposes of personal services on direct cost, there should be a provision for simple certification by the investigator that he had devoted at least the fraction of time or effort charged to the grant. In the case of indirect cost, it should be possible to limit the accounting required to those personal services of interest to the government (that is, those now listed under the indirect cost categories "General Administration" and "Departmental Administration"). This would leave to the institution the accounting for "major functions" (A-21 terminology) such as Instruction and Departmental Research. Moreover, the Board suggests the possible use of alternative proposals* in the recent report, Accountability: Restoring the Quality of the Partnership from the National Commission on Research.

The Board appreciates your consideration of its views. If we can assist in the satisfactory solution of the problem that may be encountered, we would be pleasedto give the matter further attention.

Sincerely yours,

Lewis M. Branscomb
Chairman

cc: Dr. Richard C. Atkinson, Director, NSF
Dr. Frank Press, Science and Technology
Adviser to the President

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*Recommendations 4 and 5 in that report.

216:30-31

RELATIONSHIPS WITH INDUSTRY

AWARDS FOR PROFIT-MAKING ORGANIZATIONS

Planning and Policy Committee

Twenty-fourth Meeting--January 16--Dr. Cooke, Chairman, reported that the Committee recommended Board reendorsement of the present NSF policy regarding Scientific Research Project Support which restricts awards to profit-making institutions to exceptional cases as set forth in paragraph (3) on page 4 of "Grants for Scientific Research" (NSF 73-12):

> (3) Private Profit Organizations: Industrial organizations are infrequent recipients of awards from the Scientific Research Project Support Program. However, in exceptional cases, unsolicited proposals for basic research will be considered from industrial organizations where: (a) the project is of special concern from a national point of view and shows promise of solving an important scientific problem; (b) unique resources are available in industry for the work; or (c) the project proposed is outstandingly meritorious.

Upon the recommendation of the Committee, the Board acted as follows:

> The Board unanimously REENDORSED the policy regarding awards to profit-making organizations as set forth in paragraph (3) on page 4 of "Grants for Scientific Research" (NSF 73-12) quoted above.

ES:169:6,
ES:169:14

> The Board ACCEPTED the recommendation of the Planning and Policy Committee not to include in the final NSF report on funding patterns recommendation 4 on page 8 of NSB-76-396 to "Allow researchers in industry to compete on an equal basis with other researchers for basic research funds."

186:4

NSB-78-53

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 195TH MEETING ON JANUARY 19-20, 1978, ON UNIVERSITY-INDUSTRY COOPERATIVE RESEARCH

The National Science Board unanimously APPROVED in principle the plan to expand the funding by the National Science Foundation of cooperative university-industry research projects and the actions proposed in NSB-78-11.

January 31, 1978

PROPOSED LANGUAGE CHANGE REGARDING NSF SUPPORT OF BASIC RESEARCH IN INDUSTRY

Dr. Reynolds, Chairman, reported that the Planning and Policy Committee (PPC) had noted the recommendations of its Subcommittee on NSF Support of Basic Research in Industry (NSB/PPC-77-111, November 7, 1977) that NSF policy for supporting basic research in industry should remain unchanged and that new industry-university coupling programs should be created and supported by NSF as a constructive approach to encouraging increased basic research by industry.

The PPC had also discussed the proposed revision to the policy statement clarifying the Foundation's position on the support of research in industry, as stated on page 3 of the Grants for Scientific Research (NSB-78-8--Members' Books, Tab L). The PPC observed that a slightly more general policy statement would be desirable since this policy would appear in a number of Foundation publications. It also made a slight substantive change to the statement proposed in NSB-78-8. Both changes were reflected in a revised policy statement contained in NSB-78-42 which was distributed at the meeting.

In the brief discussion which followed, it was agreed that a more positive statement of the Foundation's position would be desirable. The Board then took the following action:

NSB/Res-78-6 The National Science Board unanimously DECIDED that the Foundation's policy on the support of basic research by private profit organizations should be modified as indicated by the following language, which should be substantially reflected in National Science Foundation policy documents:

> The National Science Foundation welcomes unsolicited proposals from commercial firms. But it also wants to avoid substituting Federal support for normal commercial investment in research or compromising the vitality of

research in educational institutions, where research makes a special added contribution to science education. Thus, unsolicited proposals for scientific research project support from commercial firms may be funded where: (a) the project is of special concern from a national point of view; (b) special resources are available in industry for the work; or (c) the project proposed is especially meritorious.

The National Science Foundation is also particularly interested in supporting research projects that couple the research resources and perspectives of industry with the research resources and perspectives of universities. It therefore especially welcomes proposals for cooperative research projects involving both universities and industry.

195:16-17

PROPOSED CHANGES IN "CRITERIA DOCUMENT"--GUIDELINES FOR SELECTION OF PROJECTS

The Board discussed the recommendations of the PPC on the revisions to Criteria for the Selection of Research Projects by the National Science Foundation as contained in Section 6 (NSB-78-498, Members' Books, Tab L) and the following changes to Criteria I and XIII:

a. Under Category A--Criteria relating to creative performance of research--the technical ability of the performer and adequacy of the institutional base:

I. Potential for future accomplishment by the scientist, based on the recent record of performance, experience, and training.

b. Under Category D--Criteria relating to future and long-term scientific potential of the United States:

XIII. Probability that funds allocated for the research will aid the effort to avoid undue concentration in any region of the Nation.

The Board then acted as follows:

NSB/Res-79-5 The Board unanimously ACCEPTED the recommended changes to the Criteria for the Selection of Research Projects by the National Science Foundation.

203:24

YOUNG INVESTIGATORS

YOUNG INVESTIGATORS POSTDOCTORAL PROGRAM

Dr. M. Kent Wilson presented the staff's recommendations regarding the implementation of the new Young Investigators Postdoctoral Program as contained in NSB-78-386 (distributed at the meeting).

At its May meeting the Board had authorized the initiation of this Program and had requested the staff to bring to the Programs Committee and the Board for specific approval a detailed implementation plan and the Program Announcement prior to issuance.

The staff in NSB-78-386 proposed two options:

> Option 1: To implement the Program immediately by announcing that postdoctoral applications will be accepted by individual programs to compete with research proposals throughout the year.
>
> Option 2: To implement the Program immediately by announcing an annual competition for a targeted number of fellowships (100 to 300) by division.

Dr. Wilson reported that the staff was concerned about whether or not providing only a stipend and a small amount of research support would allow the young investigators the research freedom which is the goal of this Program, and whether the postdoctoral fellowships would be concentrated in a relatively small number of institutions. For these reasons the staff recommended initiating the Program in stages and preferred implementing Option 1 at this time, but reserving the right to go to Option 2, if appropriate, later.

Dr. Rich pointed out that the freedom for a young postdoctoral to choose the investigator with whom he wishes to do research is an important factor. Further, these young scientists will be coming from all parts of the country and from a large number of disciplines to go where exciting science is being done. He was concerned that Option 1 would not set up a distinct postdoctoral program, but that the proposals received would be considered in direct competition with research proposals from experienced researchers and would thus be less likely to be supported. He felt strongly that there should be a separate announcement to the public stating the objectives of the Program and enumerating the disciplines which are to be emphasized.

After considerable discussion on the advantages and disadvantages of implementing Options 1 and 2 within a given time frame, and after several amendments, the Board adopted the following resolution:

NSB/Res-78-95 The Board unanimously AGREED that Option 1 of the Young Investigators Postdoctoral Program be implemented so that awardees may receive support as soon as possible in as many divisions of the basic research directorates as possible; that competition

for such support be separate
from that for other research
proposals within each division;
and that there be a review of
the Young Investigators Post-
doctoral Program at an appro-
priate time with consideration
of implementing Option 2 at
that time.

It was the sense of the Board that the above action would permit this Program to be developed with the usual review of criteria and procedures in each research area initiating the activity, first by the Programs Committee and then by the Board, and that the Program should be implemented as soon as feasible. Funds for the postdoctorals will come from the divisions implementing the Program.

201:10-11

POLICIES FOR RESEARCH
(Other Than Funding)

FOUNDATION POLICY RELATING TO PRIVACY AND BEHAVIORAL RESEARCH

The Director presented his memorandum (NSB-67-107--Members' Books, Tab W) recommending that greater efforts be made (1) to identify possible dangers in which invasions of privacy or other abuses may arise in psychological testing and behavioral research in advance of the actual conduct of the research and (2) to adopt such remedies as are necessary. Attached to the Director's memorandum was a statement prepared by Mr. Charles Maechling, Jr., Deputy General Counsel--Special Projects, reviewing some of the legal and policy aspects involved in the conduct of research connected with human subjects and describing administrative and other action already taken to safeguard rights of privacy.

> The Board unanimously AUTHORIZED the Foundation to (1) make known to grantees engaged in biomedical, social and behavioral research its concern over the rights of privacy of persons individually or collectively involved in such research, and (2) as necessary, satisfy itself that grantees are taking appropriate measures for securing the subject's informed consent, maintaining the confidentiality of data and otherwise safeguarding his right to privacy.

112:30

NSB-67-107

May 8, 1967

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

MEMORANDUM TO THE MEMBERS OF THE NATIONAL SCIENCE BOARD

Subject: Privacy and Behavioral Research

I would like to call your attention to the Report entitled, "Privacy and Behavioral Research", issued in February, 1967 by the Office of Science and Technology and distributed to you at the March meeting of the Board. The Report was prepared by a distinguished panel drawn from outside the Government.

The Report examines a number of situations in which invasions of privacy or other abuses may arise in the context of psychological testing and behavioral research. I am persuaded by the Report that greater efforts must be made to identify such possible dangers in advance of the actual conduct of research and to adopt such remedies as are necessary.

In addition, the attached paper prepared by our Office of General Counsel reviews some of the legal and policy aspects involved in the conduct of research involving human subjects and describes administrative and other action already taken to safeguard rights of privacy.

Besides encouraging institutions to be continually aware of the problem, it is our belief that where Federal funds are involved the granting agency should assure itself that grantees adhere as closely as possible to the principles laid down in the Report. I do not, however, consider that this requires the imposition of any stringent administrative controls at this time. The Foundation supports relatively little research involving human subjects, we have had no indications that rights of privacy are being infringed in such research, and our present safeguards seem adequate. Consequently, I would recommend that the Board adopt a resolution authorizing the Foundation to (a) make known to grantees engaged in biomedical, social and behavioral research its concern over the rights of privacy of persons individually or collectively involved in such research, and (b) as necessary, satisfy ourselves that grantees are taking appropriate measures for securing the subject's informed consent, maintaining the confidentiality of data, and otherwise safeguarding his right to privacy.

Leland J. Haworth

Leland J. Haworth
Director

Attachment

Attachment
NSB-67-107
May 8, 1967

PRIVACY AND BEHAVIORAL RESEARCH

Legal and Policy Aspects

In considering what action, if any, should be taken to implement the PSAC Report on Privacy and Behavioral Research, it may be useful to recapitulate briefly the background and concerns which led to its issuance.

The most significant factor underlying public concern in recent years over infringements and violations of personal rights of privacy has been a vast expansion in the scope and technique of methods for exercising surveillance over human subjects. Of the three principal methods--physical surveillance, data surveillance, and psychological surveillance--the first two have aroused the widest concern and been the subject of the most publicized surveys and investigations. These aspects of the privacy problem are of no direct relevance to the National Science Foundation or to the research and educational activities which the Foundation supports. They are nevertheless important because the publicity which they have generated and the legal and policy safeguards which they have stimulated have carried over and been extended to the field of social and behavioral research.

Coincidental with this rise of public concern has been a rapid evolution and strengthening of the legal concept of privacy--a right barely discernible in common law, not covered in the Constitution, and until recently confused and overshadowed by property considerations (i.e., subject to the test of ascertainable financial damage). As now articulated, this concept is defined as the right of an individual not to have his private, personal affairs laid bare to the world. As in the case of all other rights, the right of privacy is not absolute. Its force and effect is subject to and modified by a whole series of other rights inherent in our society--e.g., freedom of the press, disclosure requirements for school and job, etc.

When personality tests, questionnaires, certain kinds of drugs, secondary data (e.g., court, school and hospital records) and other research techniques are employed in research in a manner designed to reveal more about a person than he has knowingly consented to, there is a strong presumption that his right of privacy has been infringed. The same likelihood exists when data and records accumulated for one legitimate social purpose are diverted to another use, or when a subject's identity is revealed to a wider public than originally intended. In extreme cases such an infringement may constitute a violation of law or create grounds for other legal or administrative action. In less extreme cases it may run counter to accepted ethical standards or to governmental policy.

Only a small proportion of biomedical, social, or behavioral research gives rise to situations which might threaten individual privacy. It is probably only the vast numerical increase in research surveys, questionnaires and studies that has elevated problems of occasional indiscretion or abuse of confidence to the plane of national discussion. Nevertheless, there has recently been enough public concern over the issue to provoke a wide-ranging series of studies and investigations, some instituted by public bodies and some by private groups. Three Congressional committees have held hearings on invasion of privacy, the most noteworthy being the Subcommittee of the House Committee on Government Operations chaired by Representative Cornelius Gallagher in the 89th Congress (1965-66). Several state legislatures have conducted hearings and investigations, in some cases leading to legislation. From 1962 to 1965 the Bar Association of the City of New York conducted a scholarly review of the field under a grant from the Carnegie Corporation. The Research and Technical Programs Subcommittee of the House Committee on Government Operations (Rep. Reuss) has again reviewed the matter in one section of the four-volume report issued in April, 1967 on social research in Federal domestic programs. Three academic associations--the American Psychological Association, the Association of Applied Anthropologists, and the AAUP--have recently adopted codes of ethical standards to govern psychological testing in social and behavioral research, supplementing similar codes of medical groups, some of long standing.

The reports, articles and other literature emanating from these surveys and deliberations have generally tried to strike a balance between the need to protect the rights of individuals and the need of the scientific and academic communities for freedom to conduct research untrammelled by governmental interference or other artificial restraints. Nevertheless, some of the recent findings have been disquieting, if only in their revelations of careless treatment of personal data and deceptive practices in obtaining consent. There is also evidence of poor communication between the public and the scientific community, with some disposition on the part of the latter to underestimate the degree of public concern and to discount its motives.

In the area of law and governmental policy the following developments are noteworthy as indicators of a trend toward a more careful regard for personal privacy:

- An increasing tendency on the part of state and federal courts (including especially the U.S. Supreme Court) to take a restrictive view of techniques for physical and data surveillance for purposes of law enforcement.

- Recent Congressional activity in the privacy field--e.g., proposed anti-wiretapping legislation, bills to protect the rights of government employees, etc.

- A growing number of state statutes aimed at physical surveillance but sometimes covering rights of privacy in general--e.g., "anti-eavesdropping" statutes in thirteen states, privileged status for psychologist-client communications in eighteen states, etc.

- Greater Executive Branch concern over the effectiveness of a number of Federal statutes and regulations of long standing which cover information obtained from or concerning individuals--e.g., those governing release of census data or tax information; those prohibiting release of certain financial or proprietary data obtained from the public; and the statute requiring Budget Bureau approval of questionnaires to ten or more persons.

- Administrative action by the Department of Health, Education and Welfare to define the terms and conditions under which biomedical, social, and behavioral research can be conducted by its contractors and grantees.

- Issuance of the PSAC Report of February, 1967 on Privacy and Behavioral Research.

Of the above, only the last two directly relate to behavioral research. But the scope of some of these statutes and court decisions casts a shadow over the whole field.

To date, administrative measures to regulate the manner in which research on human subjects is conducted by institutional grantees has been limited to the action taken by the Department of Health, Education and Welfare. Here two different methods are employed. The Office of Education itself screens questionnaires and testing devices used by contractors and grantees in OE programs. The Public Health Service, acting on behalf of the National Institutes of Health, delegates this function to the research institution--but requires certification that certain safeguards have been adopted to assure the voluntary nature of the subject's participation, the maintenance of "confidentiality", and the protection of findings from misuse. To accomplish this, PHS requests the grantee institution to set up an administrative mechanism to monitor the research, and insists that before the inception of each project a committee of the investigator's associates, none of whom has vested interest in the specific project involved, must satisfy themselves that the subject's rights are protected.

Thus, although both law and policy on the subject are far from certain, two criteria have emerged for the conduct of research involving human subjects: (a) a requirement that the subject give his informed consent to attempts to elicit information about his behavior, actions and personal history; (b) a requirement that the personal data obtained be treated in a way that will insure "confidentiality." The articulation of these principles is relatively simple, however, compared to their application. Each case requires individual treatment and a practical accommodation of conflicting interests. For example, "confidentiality" may necessitate coding of identity and destruction of data after use in cases where the subject's anonymity has been disclosed or compromised; it may also impose strict limits on the extent to which data collected for one purpose can be disclosed or used for another.

Two points should be made in conclusion. First, law and policy on the rights of privacy are in a state of transition and will continue so for as long as surveillance techniques and data analyses are employed as research tools. Second, legal and policy principles applicable to biomedical and social and behavioral research will continue to be influenced, and in some cases determined, by statutory and judicial developments in the whole field of privacy.

Charles Maechling, Jr.
Deputy General Counsel

NONLETHAL WEAPONS

Dr. Handler expressed his displeasure at the Foundation's entrance into the nonlethal weapons area and the fact that the Board was not informed of such action. In his view support of such activity as the recent conference and related research on nonlethal weapons is more appropriate for the Department of Justice, which does have funds available for research of direct interest to its mission. Dr. Handler strongly urged that in the future such policy and sensitive proposals be submitted to the Board for approval.

The Director explained the role of the Foundation in the support of the conference and the subsequent report to the Foundation by the Security Planning Corporation, "Nonlethal Weapons for Law Enforcement--Research Needs and Priorities," which had received recent press attention. He further reported that Senator Edward M. Kennedy (D.-Mass.) had requested the Foundation to provide support in this area.

The Board reiterated its understanding as part of the general delegation of authority to the Director that unusual or sensitive proposals regardless of dollar amount be submitted to the Board for approval and that grants and contracts "of special interest" be reported to the Board. The Director agreed to check the review and approval mechanism to ensure that these requests are being fulfilled.

ES:147:4

NSF POLICY FOR RESEARCH AND EDUCATION

Institutional Committee

The Board discussed at length a draft paper presented by Dr. Morison from the Institutional Committee setting forth the policy of the Board on the support of research and scientific education.

> The Board unanimously ACCEPTED the statement of policy proposed by the Institutional Committee attached as Appendix C.

The discussion also indicated that the Board should have, and find ways to recapture, a degree of influence over funding decisions which is commensurate with its responsibilities under the law for the health and welfare of science and its position as putatively representative of "the scientific community."

Since the Institutional Development Programs represent a considerable investment of U.S. tax dollars and are now being terminated at the request of OMB, Dr. Handler recommended that a detailed assessment of their effectiveness be made at the first appropriate opportunity. Dr. Levin indicated that such a review could not be made until a greater portion of available funds had in fact been expended (some $100 million are still available), but that the staff had such a review very much in mind and had in fact already taken preliminary steps to plan for it at those institutions where support has been terminated.

ES:135:7

APPENDIX F

POLICY AS APPROVED UNANIMOUSLY
BY THE NATIONAL SCIENCE BOARD
AT ITS 135TH MEETING
January 21-22, 1971

1. Policy--Revival of attention, concern, and planning energy to
    - (a) science education
    - (b) scientific manpower
    - (c) scientific equipment and facilities
    - (d) institutions

    in addition to continued emphasis on scientific research, basic and applied.

2. Policy--Revival of attention, concern, and planning energy to distribute Federal funds through mechanisms and programs that enable institutions to provide a healthy atmosphere for individual teaching, research, and study and for appropriate relationships to the community.

3. Policy--Given the dangerous fiscal situation of private and public colleges and universities, the National Science Board should lend what weight it has to the concept that Federal support of institutions of higher education on a major scale is critically necessary, and necessary now.

4. Policy--The National Science Board should have five-year and ten-year goals. Whatever the year-to-year battles (with victories and losses) with a given administration or a given staff of Office of Management and Budget or a given set of Congressional committees, it should:
    - (a) be continuously able to graph in specific ways those year-to-year results against a longer stretch of objectives and programs; and
    - (b) allocate a regular part of its attention and energy toward the accomplishment and attainment of its forward vision several years ahead.

135:30

MANPOWER AND PERFORMER BASE

Task Force 1

The Committee recommended and the Board accepted the proposal of Task Force 1 to undertake a critical comparative study of existing projections and to prepare a report on scientific suggestions as to the nature of the study and report and proposed that it be prepared by an ad hoc subcommittee under the aegis of the Planning and Policy Committee. The subcommittee would be authorized to contract portions of the study with competent outside groups (e.g., The Brookings Institution) as appropriate.

The subcommittee would be requested to prepare a report for publication under the auspices of the Board analyzing available studies of scientific and technical manpower supply and demand and the assumptions underlying them, including an independent comparison and assessment. In addition an internal report would also be prepared analyzing forseeable changes (e.g., pending legislation), and the effects they might have on manpower supply and demand. A principal goal of this entire effort will be to improve the basis and manner of support and utilization of scientific and technical manpower.

The Board Chairman announced that Dr. O'Neal had agreed to serve as Chairman of the Ad Hoc Subcommittee on Manpower Report and appointed as members the following: Dr. Brooks, Dr. Campbell, Dr. Dicke, Dr. Hahn, and Mr. Meckling.

Task Force 2

The two major recommendations of Task Force 2 have been implemented. The revised "Criteria" paper was submitted to the Board for consideration at this meeting, and the Board is engaging in a review of the distribution of funds among the various disciplines.

Task Force 3

The Board accepted the Committee's recommendations regarding the report of Task Force 3 as follows: (1) adopt the draft document "Maintaining the Health of Academic Science While Broadening the Performer Base of National Science Foundation Programs" (pages 32-33 of the Executive Session Minutes of the June 1973 Board meeting) as an interim working document of the Foundation subject to future modification;

(2) appoint an ad hoc subcommittee to analyze the long range impact of changes in Foundation policy regarding the types of research performers it will support; and (3) transmit the revised statement of research performer participation in the education program (pages 34-35 of the Executive Session Minutes of the June 1973 Board meeting) to the newly nominated Assistant Director for Education for comment: subject to his approval, the Board agreed to adopt the statement as Foundation policy.

APPENDIX H

BOARD DISCUSSION OF REPORT OF TASK FORCE 3

Dr. Reynolds, Chairman, presented the report of Task Force 3 to the full Board. Issue III deals with the balance between academic and other research performers. Dr. Reynolds explained the reasons for reexamining the Board's position on Issue III and noted that it is the same as last year's Issue 5 which the Board merged with last year's Issue 1 covering the health of science (attached to June 1972 Executive Session minutes--NSB-72-182).

Dr. Reynolds explained the problems that were inherent in the term "a more open door policy" and indicated the reasons why the task force was recommending modification of the Board's preliminary position on last year's Issues 1 and 5. He also reviewed the task force's views on cost sharing and indicated that the task force felt that the present procedures followed by the Foundation on cost sharing were satisfactory. Some

Members of the Board expressed concern about the degree of protective language covering university participation in NSF programs, particularly Scientific Research Project Support. Dr. Reynolds explained that it was the consensus of the task force that the limited resources of the Foundation were not adequate to provide for full industry participation in the basic research programs of the Foundation without endangering U.S. scientific strength as represented by the research programs of academic institutions.

The Board generally agreed with the recommendations of the task force on the understanding that they would be subjected to a detailed review by the Planning and Policy Committee.

Syl McNinch, Jr.

August 16, 1973

APPENDIX I
July 13, 1973

REPORT OF TASK FORCE 3

Issue: III Balance between academic and other research performers. What criteria and strategies should the National Science Foundation use in reaching an appropriate mix with respect to academic and other institutional clients?

1. Reasons for Reexamining Issue

a. Experience of Foundation over past twelve months in attempting to implement National Science Board policy covering "a more open door policy" with respect to the kinds of institutional performers used by the Foundation.

b. Expressions of interest on part of congressional committees and Office of Management and Budget staff concerning NSF/industry interface.

c. Increasing interest on part of industry to participate in NSF programs, particularly small research and development (R&D) firms, e.g., dialogue between Dr. Harvey Brooks and Dr. Arthur S. Obermayer on cost sharing requirements for small R&D firms and other industry participation related matters.

2. Context

Issue III is the same as last year's Issue 5 considered by the Board. At the June 1972 Board meeting, Issue 5 was merged with Issue 1 covering the health of science. (Issues 1 and 5 are attached to the Executive Session minutes--NSB-72-182.)

The purpose of the task force was to review Issue III and related material in the light of the Foundation's experience over the past several months to (a) determine what progress had been made toward implementing the Board policy, (b) identify the constraints or problems encountered, and (c) recommend changes or modifications in actions taken or planned concerning matters related to Issue III.

Throughout this report, the term "open door policy" is interpreted by the task force to mean broadening the performer base. This interpretation is incorporated into one of the task force recommendations.

3. Approach

The task force (a) reviewed the Board policy statement covering "a more open door policy," (b) examined all back-up data in the planning issues document (NSB-73-173--"Planning Issues and Background Information"), (c) heard a presentation by Mr. Bolton on actions taken and planned by the Foundation to implement the Board policy, and (d) discussed the different views and developed a number of recommended actions.

The task force chairman posed a number of questions during the discussions that helped focus comments and suggestions on the issue. These included:

a. Are there any inputs from the staff or any source that would indicate that Issues 1 and 5 have led to any program management or policy problems for the Foundation?

b. Is there a need to address Issue III separately from last year's Issues 1 and 5 in order to clarify the Board position on broader performer participation?

c. Does the Board really mean "open door policy" or something less?

4. Task Force Actions and Recommendations

a. Issues 1 and 5 on maintaining the health of academic science and broadening the performer base ("open door policy") are generally sound. However, for purposes of clarity, certain word or phrase changes are necessary, and paragraph 3 of the statement requires major modifications.

The task force believed that the mix of performers should be broadened. The strategy for achieving this should be such that university research will not be damaged in the process. The task force recognized the present bias in the system but believed that the high quality of academic science is of such importance to overall scientific strength that no action should be taken that would endanger it.

The task force believed that the principal criteria for reaching an appropriate mix should be the quality of the proposed work and the demonstrated capabilities of the proposers.

The task force recommended that the Board adopt the attached revised policy statement with regard to maintaining the health of academic science while broadening the performer base of Foundation programs.

b. The task force reviewed the individual policy statements on broadened participation covering major Foundation programs prepared by various major organizational units of the Foundation, and approved by the Director on June 13, 1973 (included in NSB 73-173). The results of this review are as follows:

(1) The statements on RANN (page III-16), Experimental R&D Incentives (page III-19), International Decade of Ocean Exploration (page III-24), Computer Applications in Research and Computer Impact on Society (page III-26), and Science Information (page III-27) are satisfactory,), and no change was recommended.

(2) A minor change is required on the statement on the National R&D Assessment Program (page III-22): in the second sentence on page III-23 delete "Universities" and substitute "Each organization."

(3) The task force took exception to the statement on Science Education (page III-31), because it seemed to be internally inconsistent. The first page made a strong case for broadened participation. This is

countered by the "Program Statement on Industry Participation" which is so strongly biased as to exclude other than university performers. Consequently, the task force recommended that the "Program Statement on Industry Participation" on page III-26 together with the statement on page III-31 under the heading "Advantage of Industry Participation" be used in lieu of the present language covering industry participation in science education (revised version attached). The task force believed that the revised version will clarify the NSF position on "broadening the performers" in science education. The revised statement also provides protection for academic performers,

(4) The Scientific Research Project Support (SRPS) statement (page III-29) does not promote that part of the Board policy which is aimed at "a more open door policy" with respect to performers. However, the task force believed that the statement is consistent with the intent of the Board policy statement, because it provides for a course of action that will help ensure the health of academic science. Based on NSF staff input and discussion, the task force believed that the Foundation's resources are too limited to make "opening the doors" to industrial performers practical in the case of SRPS without seriously reducing the level of support available for academic performers.

c. The task force believed that the term "open door" as used in the current Board policy statement is misleading and recommended that this term be changed to "broader participation."

5. Cost Sharing

Another matter given considerable attention by the task force was cost sharing. Mr. Bolton reported on current NSF practices regarding cost sharing, summarized as follows:

a. Cost sharing is required on unsolicited proposals, regardless of the type of performer.

b. Cost sharing is not required on solicited proposals, regardless of the type of performer.

c. In cases where it can be determined that there is no mutuality of interest for an industrial performer on a particular unsolicited proposal, the Director of the Foundation can make an administrative decision as to whether or not cost sharing is required.

The task force expressed its appreciation for the presentation made by Mr. Bolton and for the assistance provided by Mr. NcNinch and other NSF staff members.

ES:157:27:31

Attachments (2)

LONG RANGE PLANNING AND POLICY ISSUES--CONSIDERATION BY BOARD OF TASK FORCE REPORTS AND PLANNING AND POLICY COMMITTEE RECOMMENDATIONS

Dr. Cooke, Chairman, reported that the Planning and Policy Committee had considered the final reports of the task forces established for consideration of long-range policy issues at the June Board meeting and presented the Committee's recommendations.

1. Task Force A--Institutional Science Support

Task Force A recommended the establishment of three types of institutional support programs: (a) programs to foster university-industry work-study programs at the graduate level; (b) programs to purchase scientific equipment; and (c) programs to provide targeted fellowships, to be based on need, including cost-of-education allowances and additional funds for counseling and related services.

The Planning and Policy Committee recommended that the Board approve, with minor alterations, the Task Force's recommendations as set forth above and covered in detail in the Executive Session Minutes of the June Board meeting (pages ES:165:14-16).

> The Board unanimously APPROVED the above recommendations and REQUESTED the Director to implement them as amended by the Planning and Policy Committee for priority consideration for inclusion in the fiscal year 1977 budget estimates and to the extent possible in fiscal year 1976.

2. Task Force B--Basic Research in Mission Agencies

Task Force B considered actions which could be taken to ensure that mission agencies maintain strong basic research programs in accordance with announced policies of the Administration. Task Force B recommended and the Planning and Policy Committee concurred that programs required to achieve a strong and broad base of support for basic research should be developed through discussions between the Director, OMB, and responsible departmental and agency officials. Further, the Board should play a more active role in these efforts.

Following a brief discussion the Board accepted in principle the recommendations of the Planning and Policy Committee as contained in the report of Task Force B from the June Board meeting (pages ES:166:17-28). The wording of the proposed revised resolution of the Task Force (distributed at the Board meeting) would be further revised by the Committee and the Director.

3. Task Force C--Future Role of the National Science Foundation

Task Force C gave primary consideration to Board policies in regard to the future role of the Foundation in four areas: (a) international science agreements; (b) science education; (c) evaluation of national programs and large facilities; and (d) support of basic research in universities. Secondary but high priority was assigned to four other areas: (a) potentially important but presently neglected research areas; (b) advantages and disadvantages of NSF involvement in the dual role of basic and applied research: relative balance between problem-oriented versus "untargeted" research; (c) role of the NSF in improving the capabilities of the social sciences; and (d) role of NSF in stimulating industrial research and development efforts.

The Planning and Policy Committee considered the recommendations of Task Force C and decided to recommend that the Board give first priority to the consideration of the Foundation's role in support of basic research at academic institutions and examine the relevancy and interrelationship of the following issue: What should be the role of the National Science Foundation in support of basic research in the natural and social sciences in colleges and universities? The Committee further recommended that the Chairman appoint a task force to study this matter and recommend Board action.

Task Force B--Basic Research in Mission Agencies

Task Force B considered actions which could be taken to ensure that mission agencies maintain strong basic research programs in accordance with announced policies of the Administration. Task Force B recommended and the Planning and Policy Committee concurred that programs required to achieve a strong and broad base of support for basic research should be developed through discussions between the Director, OMB, and responsible departmental and agency officials. Further, the Board should play a more active role in these efforts.

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SUMMARY OF REPORT AND RECOMMENDATIONS OF TASK FORCE B

Issue B: Basic Research in Mission Agencies

1. General Comment on Issue

A basic premise of the Task Force was that mission agencies should maintain strong basic research programs in accordance with announced policies of the Administration. The Task Force devoted its attention to possible actions that might be taken to ensure that Federal basic research programs are strengthened.

In addressing the issue, the Task Force was guided by responsibilities specifically assigned to the National Science Foundation and the National Science Board by the NSF Act, as amended, especially Section 3(a)(5) and Section 3(d), which state:

> SEC.3.(a) The Foundation is authorized and directed--
>
> (5) to evaluate the status and needs of the various sciences as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups, employing by grant or contract such consulting services as it may deem necessary for the purpose of such evaluations; and to take into consideration the results of such evaluations in correlating the research and educational programs undertaken or supported by the Foundation with programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups;
>
> (d) The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences.

2. The Problem

In recent years, mission agencies have shifted much of their support of research to those projects which have a high potential for mission application in the near term. Informal contacts with branch chiefs and other program managers involved in research programs in the Department of Defense (DOD), for example, indicate that informal guidelines given them tend to limit their support of research to projects that have a payoff in terms of mission objectives within a _____ . . . time frame. This guidance is further reducing the level of long term basic research funded by DOD.

The "Federal Funds for Science" report series and other statistical analyses of Federal support for research do not reveal the actual nature of basic research programs being carried out by the mission agencies. There are also indications that research that is identified as "basic research" by some mission agencies would not be considered to be basic research by generally accepted standards of the scientific community. Consequently, there is no effective mechanism at the Federal level to determine the nature of the total Federal basic research effort.

3. Approach

The Task Force reviewed historical and statistical data compiled by the NSF staff needed for the study and analysis of the issue.

These data included:

a. A review of the "Mansfield Amendment" and its subsequent impact on NSF.

b. Data on basic research support trends in other Federal agencies.

c. Data showing the increasing NSF role in Federal support of basic research.

d. Summary funding data on the dropout problem.

In addition, the Task Force developed a short list of questions, which were sent to Federal agencies currently conducting major research programs. The survey questions were designed to obtain information on:

a. The agency's operating definition of basic research.

b. The agency's guidelines on the target ratio of basic research to the total research and development program of the agency.

c. The relative importance assigned to various science disciplines by the agency in terms of its mission responsibility.

d. The various types of institutional performers involved in the agency's program and percentage of the agency's program carried out by each type, i.e., industries, universities, Federal laboratories, etc.

A brief summary of the findings of this survey is included in Attachment 1 to this report. Significant highlights of the survey results are listed below:

a. There is a very wide latitude for interpretation by research managers in thevarious agencies of what does and does not constitute basic research for reporting purposes. There is no effective mechanism at the Federal level for ensuring that basic research programs are in fact basic, as viewed by the scientific community.

b. The mission agencies surveyed do not have guidelines on a desired ratio of basic research to their total programs, nor do they set any target levels for basic research support.

4. Task Force Discussion and Views

a. The Task Force believes that it is not desirable for NSF to become the sole or dominant agency responsible for the support of basic research in all areas on a Federal-wide basis. NSF currently provides about 16 percent of the total Federal support for basic research, and this percent cannot be greatly increased in the near term. Overall, the mission agency Federal total for basic research is and has been severely constrained since about fiscal year 1968. A general improvement in Federal-wide support of basic research can only be achieved through an overall strengthening of basic research efforts. The Task Force believes that NSF should play an increasingly active role in encouraging mission agencies to strengthen their basic research programs and in evaluating the strengths and weaknesses of the total Federal basic research effort.

b. It is the view of the Task Force that no written definition or description of basic research or statistical reporting data are likely to reveal the true nature of a particular agency's operating philosophy or program for basic research.

c. All agencies have not complied fully with the President's Special Message on Science and Technology of March 16, 1972, that all Federal agencies are to carry out strong programs of basic research in areas related to their missions.

A number of major agencies, such as the Department of Housing and Urban Development (HUD) and in the Department of Transportation (DOT), do not have basic research programs, even though such programs could contribute significantly to the accomplishment of their mission objectives over the long term. There are also differences among the agencies as to what constitutes basic research. Another factor is that some members of the Congress continue to insist that DOD fund only that research that can be readily identified with a defense mission in the near term.

d. The Task Force noted that, while many mission agencies have strong programs of basic research and recognize their value, some agencies with major domestic missions, such as DOT and HUD, do not invest in basic research.

Experience has shown that scientific understanding that comes out of basic research greatly improves prediction capability. It also leads to improvements in technology, including methods of detection and measurement, and generally enhances our capability for adaptive response. Since basic research programs can provide agencies with an improved capability to deal with changing conditions and circumstances which impact on their missions, the Task Force believes that NSF should encourage mission agencies to undertake basic research efforts. A possible approach could be for the Foundation to provide information to mission agencies on areas of basic research which have good potential to benefit their objectives over the long term with a view to the initiation by the mission agency of basic research support efforts.

e. The Foundation has assumed the support of a number of major programs formerly funded by other agencies, principally DOD. The Materials Research Laboratories and the National Magnet Laboratory are examples. These actions were taken by NSF without benefit of a standing

NSF position on the assumption of these expanded management and funding responsibilities. The Task Force believes that taking on these responsibilities, in some instances, may provide an incentive to mission agencies for further cutbacks in their support of basic research. Therefore, each new request to NSF for such support should be reviewed in terms of its likely consequences to the mission agency's support program for basic research. The National Science Board should, in the view of the Task Force, develop a policy statement on the NSF posture to be taken with regard to potential "pickups" of mission agency "dropouts."

f. Currently, there is no easy way to evaluate or even take a look at the Federal-wide basic research effort in any comprehensive manner. For example, there is no complete simplified "map" of the interrelationship of NSF basic research activities with those of other agencies. Basic research is usually a small component of an overall agency program or project. There is no recognized Federal basic research program per se. Budget cutting decisions are usually aimed at programs or projects, and the resulting impact on U.S. science efforts is rarely if ever accurately assessed until resource projects are terminated for lack of funds. The basic research portions of mission agencies' budgets are particularly vulnerable, since they are rarely separately identified and are often used as the adjustment nut in any squeeze-down resulting from a budget cut. The Task Force believes that NSF must take the lead in bringing information together on the nature and magnitude of overall Federal basic research programs to determine its balance, its strengths and weaknesses, etc.

5. Task Force Recommendations

a. That programs required to achieve a strong and broad base of support for basic research be worked out through discussions between the NSF Director and the leaders of the other involved agencies. The National Science Board should play an active role in these efforts. It is also important that the Foundation and the Board be able to articulate what constitutes basic research and to describe ways in which sound basic research programs can benefit mission agencies. The brief survey of mission agency basic research, made by the Task Force, should be followed up with a series of separate discussions between the NSF Director and selected mission agency heads or appropriate top management officers. The purposes of these discussions would be:

(1) To express Board, Foundation, and Administration views and concerns for the need to maintain a strong national basic research posture.

(2) To talk candidly about the exact nature of the mission agency's basic research programs.

(3) To offer suggestions on research areas that might be of growing importance to the agency.

(4) To offer NSF assistance to the agency in initiating a basic research program, where appropriate.

b. That the NSB, through discussion (Recommendation and interaction with the Office of Management and Budget (OMB) make an effort to determine the degree of inconsistency that exists among the agencies in carrying out the President's stated policy that all agencies should have strong basic research support programs. Interviews, participation in OMB reviews, and examination of OMB special analysis data are all possible sources of data on this.

c. That the NSF undertake to assist Federal agencies in starting basic research programs where none now exists and where their long term benefits can be demonstrated. (DOT and HUD are possible examples.)

d. That the NSF develop information on the interrelationship of its basic research program with the basic research activities of other Federal agencies. Interviews, data gathering by the Division of Science Resources Studies, and OMB data are possible sources and mechanisms for obtaining this information. Also, the National Science Board should be involved in the evaluation of these data and in recommending areas that require strengthening.

e. That the National Science Board develop a general policy statement on the posture of NSF on picking up major projects or programs being dropped by other agencies due to mission relevancy considerations.

6. Proposed Resolution

To implement the recommendations, the Task Force proposes that the National Science Board adopt the following resolution:

Whereas the National Science Foundation Act of 1950 (as amended) authorizes and directs the Foundation "to evaluate the status and needs of the various sciences as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government" and specifies that the Board and the Director "shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences," it is RESOLVED that:

The Director, himself, shall hold a series of discussions with the secretaries and/or other appropriate senior officials of selected mission agencies of the Federal Government for the purposes of (a) expressing the views and concerns of the Administration and the National Science Foundation with regard to the need to maintain a strong national basic research posture; and (b) determining the exact nature and scope of the mission agencies' ongoing and planned basic research programs, offering suggestions and advice on research areas that might be of growing importance to the mssion agencies for initiating or modifying basic research programs where appropriate. The Board shall play an active supporting role in these efforts.

The Foundation, through discussions with the mission agencies of the Federal Government and through interactions with the Office of Management and Budget, shall undertake to ascertain the status of applicable mission agencies' programs of basic research.

The Foundation shall undertake to assist other Federal agencies, as appropriate, in initiating basic research programs where none now exists and where the potential for long term benefits to the agency's missions from such programs can be most reasonable.

The Foundation shall develop information on the interrelationships of NSF basic research programs with the basic research activities of other Federal agencies for use in evaluating the status and needs of the various sciences, in correlating the basic research programs undertaken and supported by the Foundation with related programs undertaken by other agencies of the Federal Government, and in recommending to applicable agencies, to the Administration, and to the Board those areas that require strengthening.

The Board shall develop and promulgate a general policy statement pertaining to Foundation assumption of management and/or support responsibilities for major program activities or projects for which support has been terminated or significantly reduced by other Federal agencies due to considerations of mission relevancy or budgetary priorities.

Syl McNinch
Executive Secretary
Task Force B

July 25, 1974

Attachment

ES:165:23

BASIC RESEARCH IN MISSION AGENCIES

Report of Task Force B

Dr. Cooke then reported that the Committee had devoted the majority of its meeting to finalizing the resolution of Task Force B, drafted at the June Board meeting and considered by the Committee at the September Board meeting, on the support of basic research by mission agencies. Following the September meeting the Director and the General Counsel offered several language changes to express more accurately the Director's role in any negotiation with other departments and agencies. The Committee, after considering these and other proposed changes, presented a revised text for the Board's action and transmission to appropriate officials in the Executive and Legislative Branches.

The Board discussed the intent and impact of this resolution, acknowledging that it called for the Board as well as the Director to take certain steps to encourage mission agencies to maintain strong basic research programs and to ensure that the best possible programs are developed, carried out, and supported. In this discussion the proposed resolution was further altered to clarify the Board's intent. The Chairman pointed out that the new Board Committee on Role of NSF in Basic Research will as its initial assignment consider what further action the Board should take in clarifying and strengthening the role of the Foundation in the support of basic research in universities.

> The Board unanimously ADOPTED the amended resolution of Task Force B (final text attached as Appendix D).

ES:167:10-11

PROMOTION OF BASIC RESEARCH IN MISSION AGENCIES

Resolution Adopted by the National Science Board at is 167th Meeting on October 18, 1974 (NSB-74-332)

Whereas, Section 3(d) of the National Science Foundation Act of 1950 as amended states that: "The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences."; and

Whereas, Section 3(a)(5) of the Act authorizes and directs the National Science Foundation to evaluate the status and needs of the various sciences as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups, employing by grant or contract such consulting services as it may deem necessary for the purpose of such evaluations; and to take into consideration the results of such evaluations in correlating the research and educational programs undertaken or supported by the Foundation with programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups; and

Whereas, the national welfare requires and it has been a long standing matter of national policy that mission agencies pursue strong programs of basic research appropriate for their missions; and

Whereas, in recent years some Federal agencies have significantly reduced their efforts in basic research relevant to their missions; and

Whereas, shifts in other agencies' support of basic research affect the National Science Foundation's capability to fulfill one of its roles to ensure the adequacy of the Nation's research effort;

Therefore, be it RESOLVED, That:

The National Science Board encourages mission agencies of the Federal Government to maintain strong basic research programs in areas that have the potential of contributing to their mission objectives over the long term;

The National Science Foundation shall develop information on the interrelationships of NSF basic research programs with the basic research activities of other Federal agencies for use in evaluating the status and needs of the various sciences, in correlating the basic research programs undertaken and supported by the Foundation with related programs undertaken by other agencies of the Federal Government, and in recommending to applicable agencies, to the Administration, and to the National Science Board those areas that require strengthening;

To assist the National Science Foundation in coordinating and correlating its basic research programs with those of other agencies, the National Science Board shall develop and promulgate a general policy statement pertaining to Foundation assumption of management and/or support responsibilities for major program activities or projects for which support has been terminated or significantly reduced by other Federal agencies due to considerations of mission relevancy or budgetary priorities;

The Director of the National Science Foundation is urged to hold a series of discussions with the secretaries and/or other appropriate senior officials of selected mission agencies of the Federal Government for the purposes of discussing the need for mission agencies to maintain strong basic research programs appropriate to their missions and the benefits that are likely to accrue from such programs over the long term. These discussions should also focus on the nature and scope of current and planned mission agency basic research efforts and on the areas of research that are likely to be of significance to mission agency programs. These discussions should be carried out with a view to strengthening the overall Federal basic research posture and to identifying areas of need in the various science fields;

The Director of the National Science Foundation is urged to take an active role in promoting basic research within the Executive Branch, including assisting other Federal agencies as appropriate in initiating basic research programs where none now exists and where the potential for long term benefits to the agencies' missions from such programs is greatest; and through discussions with the mission agencies and the Office of Management and Budget ascertain the status of Federal programs of basic research.

ES: 167:32

STATUS OF SCIENCE

Task Force 77-A

Dr. Bisplinghoff reported on the recommendations of Task Force 77-A in the absence of Dr. Koshland, Chairman. The Task Force considered the status of science materials prepared by NSF staff to summarize its perception of the status of scientific fields. The Task Force generally approved of the effort and found informative the assumptions involved in NSF's most recent long-range planning. Annual preparation of similar reviews as background material for future June Board meetings was recommended.

For staff guidance the Task Force provided a list of policy issues for special attention and/or improvement in future reviews, such as (1) institutional issues--ability of universities to maintain research capabilities, shared research facilities, interinstitutional cooperation among government, industry, and universities; (2) NSF role in industrial basic research; (3) NSF role in assisting state and local governments in research needs; and (4) management of NSF at the two billion dollar level.

The Task Force also identified several areas as possibilities for consideration as issues at the June 1978 meeting.

Dr. Bisplinghoff stated that the Task Force would prepare a final report to the Board on its recommendations in the near future. The Board Chairman requested that these recommendations be provided to the Board via the Planning and Policy Committee.

APPENDIX [illegible]

June 24, 1977

STATUS OF SCIENCE

Report of Task Force 77-A

Task Force A considered the material produced to review the status of science as perceived by NSF staff. The Task Force generally approved of the effort and found the information to be useful to the Board in providing a coherent overview of the assumptions underlying NSF long-range planning.

1. It is recommended that the status of science section be produced annually as background material for June Board meetings.

2. It is further recommended that information in future reviews be improved according to the instructions listed in Attachment I.

3. It is also recommended that the production and use of this review be coordinated by NSF staff to complement and fit into the schedule of long-range planning and budgeting of the Foundation.

The purpose of the status of science reviews is to provide the contextual background of assumptions surrounding the long-range budget planning of the Foundation. Generally, the substantive material on the directions of the fields of science should emphasize the excitement of research, current and potential, in these fields.

1. In doing so, it should also emphasize reasons of timeliness in certain special research opportunities; and the facilities, instrumentation, or special funding efforts required to encourage the pursuit of these.

2. It should also estimate and emphasize the flexibility in budgetary planning to be responsive to new directions in the fields of science (as these may arise, perceived from within the scientific community).

3. Where current and potential developments in a field can be seen as having extrinsic importance outside the field, such important relationships should be noted.

In reviewing the status of science material this June, the Task Force also identified several important issue areas which should be considered for review by the Board next June. Attachment II lists these areas, along with the issues carried over from this last year.

It is recommended that these issues be considered by the Planning and Policy Committee as possible candidate issues for the next planning environment review in 1977-1978. 1903:27

Attachment I

REPORT OF TASK FORCE 77-A

Improvement and Additions to Status of Science Reviews Updates as Appendices for Future June Meetings
(Trend data wherever possible instead of tables)

1. General purpose in summaries (and appendices to summaries) is to identify the excitement of current research as well as future science opportunities.

   a. Expand discussion of research opportunities.
   b. Include key material from advisory oversight committee reports.

2. Improve discussion of facilities and instrumentation needs.
3. Show Materials Research Laboratories and similar laboratory and center support as separate from general project support by location, level of support and specialization, number of years of support provided, and present length of commitment.
4. Show young investigator support as separate from support provided established investigators.
5. Articulate inflationary impacts, where possible.
6. Improve description of other Federal agencies' directions and levels of support in each field, where possible.
7. Add industrial directions and levels of support in each field, where possible.
8. Improve time trends on career data on Ph.D.'s (enrollment, production, employment, tenure, and movement).
9. Articulate present and potentially exciting relations between disciplines or fields.
10. Improve the information about fund flexibility.
11. Include international context descriptions, where missing. Write-ups should include cooperative as well as competitive relationships.
12. An example or case study per division is desirable where excitement or issues can be thus expressed or illustrated.
13. In addition to the above improvements, it is recommended that a science policy environment review be prepared which includes more than the Federal institutional context. It should include:
    a. Substantive policy areas (e.g., energy policy),
    b. State and local governments,
    c. Industrial policy.

Attachment II

REPORT OF TASK FORCE 77-A

Future Policy Issues

I. Institutional Issues

- A. Examine the ability of universities to maintain research capabilities.
    1. Reduction of paperwork by grantees (accountability impeding innovation).
    2. Overhead costs.
    3. Manpower problems and alternative strategies (e.g., institutes, leaves, career change).
    4. Interactions between other sources of support and functions (e.g., industrial support, educational support, state support, etc.).
    5. Focus support on a limited number of universities.
- B. Shared research facilities.
    1. Where do these exist and future opportunities?

        2. Preservation and consolidation of older collections.

        3. Management problems of participation and renewal.

    C. Inter-institutional cooperation among government, industry and universities.

II. NSF role in industrial basic research (incentives and disincentives).

III. NSF role in assisting state and local governments' research needs.

IV. Management of NSF at two billion dollar level.

V. Further crosscut studies, e.g., renewable resources.

VI. Appropriate roles of NSF in international science.

193:28-29

NSF DECISION-MAKING CRITERIA

Task Force 77-B

Dr. Hubbard, Chairman, reported that, within the decision-making framework of ZBB, the Task Force developed specific criteria for decision units to be presented to the Board after review by NSF advisory committees and the staff. He stated that he would subsequently transmit to the Director a memorandum of Task Force considerations of criteria and headings for decision-making units. 1/

The Task Force recommended that the Board have the opportunity to review the Director's proposed ZBB budget request prior to submission to OMB.

The Task Force proposed the following priorities as planning issues for 1977-1978: (1) status of science, (2) renewable resources, and (3) strategic program planning.

Dr. Hubbard further reported that Task Force 77-B suggested that the time available at the June meetings for Task Force meetings be expanded and that the dates for the June meetings be set as soon as possible so all Board Members could attend. Task Force 77-B also requested that the Task Forces and the issues to be considered be designated at an early date to avoid compacting the work of the Task Forces into the early spring.

Task Force 77-B will submit later a final report to the Board on its deliberations. This report will be submitted via the Planning and Policy Committee.

Dr. Reynolds indicated that the policy issues set forth by the Task Forces would be identified and considered at the September meeting of the Planning and Policy Committee.

191:21-22

1/ Transmitted to the Director on July 1 by Dr. Kruytbosch.

APPENDIX C

June 1977

REPORT OF TASK FORCE 77-B

Patterns of Decision-Making for Science

The major points listed below were made during the deliberations of Task Force 77-B. They were seen as general observations and suggestions pertaining to the impending implementation of the Zero Base Budgeting (ZBB) format for budgetary decision-making.

1. The original concern of Task Force 77-B was to study the degree to which scientific priorities are being set from outside the scientific community.
2. A set of case studies of decision-making in NSF was developed to illustrate a range of instances of priorities deriving from inside (bottom up) and outside (top down) the scientific community.
3. The Task Force chose to set its discussion in the context of the ZBB decision format. It utilized the case materials to examine how the variety of influences in the total play of decision-making fits the framework of ZBB.
4. For purposes of discussion the decision units involving the programs, divisions, and directorates are defined as "bottom up". The ranking criteria used by the Director are considered to be "top down".
5. It is suggested that the ranking criteria for these decision units should be developed and made specific for review and comment by the Directorate Advisory Committees. The objective is to obtain review and advice in support of developing valid ranking criteria from the Advisory Committees.
6. The committees of the Board (Executive, Programs, and Budget) should include in the ordinary conduct of their business, Board policy concerns related to the establishment of objectives and description of ranking criteria. The NSB as a whole, therefore, does not need to establish any new mechanism for the implementation of ZBB.
7. The Executive Committee should set forth for the Board the ranking criteria that have been used so that they can be endorsed by the Board.
8. The set of ranking criteria used by the Director should be comprehensive so as to represent all of the various mandates and demands upon NSF.
9. The long list of specific criteria that will be developed should be subsumed under a small number of comprehensive headings. The Task Force discussed several such headings, but concluded that a more extensive search by staff was necessary.
10. The Board should review the Director's proposed ZBB budget to the Office of Management and Budget.
11. The Task Force understands that not all of its suggestions will be able to be implemented this year due to severe time constraints.
12. In conclusion, it was the view of the Task Force that the many criteria that properly influence the allocation of resources to science will be clearly revealed through the process of Zero Base Budgeting.

PUBLICATION POLICY

Planning and Policy Committee--Forty-fifth Meeting--August 18

Dr. Reynolds, Chairman, reported that the Committee discussed policy issues involved in the publication of the scientific and personal papers of scientists as referred to the Committee by the Board Chairman at the request of the Programs Committee in the July Executive Committee meeting. Dr. Reynolds proposed a resolution (distributed at the meeting) on which the Board acted as follows:

> The Board APPROVED the policy that long-term proposals for NSF funding of the editorial development of a scientist's papers should consist of modules of five-year duration so that these can be considered independently.

192:11

POLICY COMPENDIUM/PERFORMANCE AUDIT

Committee on Mechanisms for Improved Policy Formulation and External Communications--Eleventh Meeting--August 18

Dr. Hubbard, Chairman, stated that the Committee received a report (NSB/CM-77-20) from the Assistant Director for Scientific, Technological, and International Affairs which sets forth the general administrative policies and practices followed by NSF in supporting policy research activities. The Committee perceived this report to be a complete and satisfactory statement of the special interpretations necessary for the conduct of policy-related research in the Foundation. The Committee did not bring the report to the Board for action since the procedures all fall within established NSF guidelines.

The Committee also discussed the conduct of research by NSF scientific staff. The Committee noted that it has long been NSF policy that the opportunity for research should be available to permanent staff. The one- and two-year rotational staff have posed some questions as to how this opportunity for research should apply to them. The Committee, after discussion, adopted the position that it recognizes the merit of and encourages the opportunities for research participation by professional scientific staff of the Foundation, and recommends a policy which endorses research participation by these staff members. The Committee offered this view in the hope that the Foundation would work out an acceptable device for implementing research opportunities for rotational staff.

Dr. Hubbard reported on the Committee's progress with its consideration of a Policy Compendium. This is an attempt by the staff to develop a compendium of the policies under which the Foundation conducts its business. The Committee has considered several possibilities:

(1) Rewrite existing policy statements in uniform style. (Deemed not feasible with present NSF staff.)

(2) Prepare a simple inventory of existing policies. (This has been done in part by the staff.)

(3) Develop a functional index (as opposed to a chronological sequence).

Plans for the functional index are now underway. (Completed w NSF Manual No. K Revision No. 1-- October 1977)

Dr. Hubbard reported on the Committee's deliberations on the Director's proposed program evaluation and oversight plan. He stated that performance audits fall into two categories: one is the degree of correlation between asserted procedures and observed operations; and the second is the measurement of the fulfillment of goals. The Committee endorsed the Director's recent proposal to establish a formal performance audit function in his office. Dr. Hubbard proposed a resolution to this effect from the Committee, upon which the Board took the following action:

> The Board unanimously ENDORSED the Director's plan to establish a performance audit function.

192:15-16

POLICY AND RESEARCH FOR THE HANDICAPPED

Planning and Policy Committee (PPC)--Fifty-second Meeting--April 20 (including PPC Subcommittee on International Science Activities--Third Meeting--April 20)

Dr. Bisplinghoff, in the absence of the Chairman, Dr. Reynolds, reported that on April 20 the PPC discussed the proposed regulations for the protection of human subjects and the rights of the handicapped, the application of the Freedom of Information Act (FOIA) and the Government in the Sunshine Act (GIST) to multi-year planning and multi-year budgeting, and the 1978 Planning Environment Review (PER) document.

On the protection of human subjects, the Committee recommended that the Board approve the draft regulations proposed by the staff in NSB-78-152 (Members' Books--Tab C). After brief comments by the Director, the Board took the following action:

NSB/Res-78-45

> The Board unanimously AGREED that research involving human subjects supported by the National Science Foundation shall be conducted in a manner that adequately protects the rights and welfare of the subjects; further, that the policies of the National Science Foundation on research involving human subjects shall conform as closely as possible with those of the Department of Health, Education, and Welfare and shall impose on recipients of National Science Foundation awards a minimum of different or additional requirements and paperwork.

As requested by the Board Chairman, PPC also considered the draft regulations on the rights of the handicapped (NSB-78-179--distributed at the meeting). These proposed regulations are being published in the Federal Register for comment. Board Members were invited to submit their comments also. It was the opinion of the PPC that the regulations of the Department of Health, Education, and Welfare on this matter had been carefully prepared and that any proposed changes or deviations from those regulations should be carefully considered by NSF. The Committee will review the final draft of these regulations in late summer and make its recommendation to the Board at that time.

197:8-9

BIG SCIENCE/LITTLE SCIENCE

Upon the recommendation of the Ad Hoc Committee, and in order to meet the timetable of the Congress, the Board acted as follows:

NSB/Res-78-113

The Board unanimously APPROVED the suggestion of the Ad Hoc Committee on Big and Little Science that the draft policies and procedures document for big and little science (NSB-78-428, Appendix B) be utilized in informal discussions with the staff of the House Committee on Science and Technology and the Office of Management and Budget; further, that this document be assigned simultaneously to the Planning and Policy Committee for consideration before it is formally brought to the Board with final recommendations for action.

202:17

BIG SCIENCE/LITTLE SCIENCE

NSB/Res-79-2/A

The Board unanimously ACCEPTED the revised statement on "Proposed 'Big Science' Policies and Procedures" for the restricted purpose of responding to the request of the House Committee on Science and Technology in House Report No. 95-993 (final copy attached as Appendix D).

The Ad Hoc Committee on Big and Little Science will continue its work on the Foundation's policy for big and little science.

203:13

NSB/Res-79-2/B
APPENDIX D

NSB-79-65

January 19, 1979

"BIG SCIENCE" POLICIES AND PROCEDURES STATEMENT UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 203RD MEETING ON JANUARY 18-19, 1979

A. DEFINITIONS

1. "Big science" projects, as viewed by the National Science Foundation (NSF), are those having all of the following characteristics:

a. Large-scale commitment of financial resources;

b. Investment of capital in facilities and major equipment;

c. A duration of several years or more; and

d. Continuing expenditures for maintenance, replacement, operating costs, and research budgets.

Size in this case is both absolute (cost and complexity of the effort) and relative (share of resources devoted to a particular field and share of the Foundation's overall resources).

2. With regard to funding implications, "big science" projects can be viewed as two types:

   a. Those that can be accommodated within anticipated reasonable budget levels for a field of science supported by NSF, or within anticipated overall NSF budget levels; and,

   b. Those very exceptional projects that because of their cost, complexity, and/or the involvement of other Federal agencies cannot reasonably be supported within anticipated overall NSF budget levels and thus should be proposed to the President and the Congress for consideration over and above the NSF budget.

B. POLICY FRAMEWORK

1. Balance between "big science" and "little science" in any one field should be considered in the first instance by divisions and advisory groups cognizant in that field, but balance across the Foundation is the responsibility of the National Science Board (NSB) and the Director.

2. The program plans and cost estimates for each proposed "big science" project should be reviewed by the cognizant advisory groups, NSF staff, Director, and the National Science Board as early in the planning and budgeting cycle as possible, i.e., for any given budget year, in the long-range planning meetings leading up to the budget formulation for that year.

3. Whenever possible, funding of a proposed "big science" project will be accommodated within the budget for a given discipline (based on reasonable out-year projections).

4. No specific percentage of the projected budget for a discipline should be established as a limit or control on "big science" projects; instead, the balance of "big science" and "little science," as well as the degree of "flexibility" within a discipline resulting from long-term commitments, should be reviewed periodically by the cognizant advisory groups, NSF staff, the Director, and the National Science Board, particularly when new "big science" projects are proposed.

5. When the Director and the National Science Board determine that funding of a new "big science" project cannot be accommodated within the anticipated budget for a given discipline, the project will be considered for funding (a) within anticipated overall NSF budget levels, or (b) as a special item over and above anticipated NSF budgets. Some of the factors to be considered are: the overall size and duration of the project, its relation to activities of other nations and agencies, including their ability to assist in the funding, the degree of "flexibility" in anticipated NSF budgets, and Presidential and Congressional policies.

6. No specific percentage of the Foundation's budget should be established as a limit or control on the overall number of "big science" projects. Instead, the balance of "big science" and "little science" across the Foundation, as well as the degree of "flexibility" in the budget resulting from all long-term commitments, should be reviewed by the Director and the National Science Board each year in connection with long-range planning.

7. All "big science" projects proposed to start in any given budget should be reviewed at the same time, and the National Science Board should establish priorities based on prior review by, and recommendations of, the Director. The phasing of projects over several budget years will be an explicit consideration.

8. The plans and estimates for any given "big science" project should also be reviewed by the Director and the National Science Board again in connection with the budget formulation stage of the cycle, and, after the budget has been appropriated, again through the Director's Action Review Board and the National Science Board approval cycle.

C. PROCEDURES

1. For the annual long-range planning cycle, Directorates proposing new "big science" projects should submit a project development plan (following a format to be designed) that briefly describes:

    a. The scientific needs for the project, including criticality, impact on the field and neighboring fields, comparison with principal alternatives, probability of success, and the size of the scientific community involved;

    b. The views of the appropriate advisory group concerning:

        (1) the priority of the project;

        (2) its effect on the balance and concentration of "big science"/"little science" within the field under varying resource assumptions (including essentially level budgets); and

        (3) the opportunities that would be foregone by undertaking or not undertaking it;

    c. Estimates of all initial and out-year costs, including those for facilities, management and operation, maintenance, associated equipment and implied grant support levels; and the basis for the cost estimates and the estimate of project lifetime;

    d. Principal management, procurement and legal considerations, such as competition, timing, appropriate legal instrument, management and organizational structure;

    e. Origin and periodicity of management and fiscal reports, and timing and other considerations for evaluating the project; and

    f. Identification of principal phases or milestones, including the point at which the project as a whole, or phases thereof, will be concluded.

2. Once the program development plans have been approved by the Director and the National Science Board, the plans will be updated whenever a significant shift in the terms or funding of the project is contemplated, and in any event the plans will be updated at least once a year in connection with the spring review of the Foundation's multi-year plans and estimates.

3. The approved program development plans will be used as the common basis for responses to the Congress, the Office of Management and Budget, the Office of Science and Technology Policy, and other external parties.

203:31-34

NSF AND SUPPORT OF RESEARCH AND SCIENCE EDUCATION IN THE 1980s

Final Report of Task Force 78-A

Dr. Hubbard presented the final report of Task Force 78-A resulting from the June 1978 long-range planning meeting (NSB-78-461--Members' Book, Tab L), on which the Board acted as follows:

NSB/Res-78-119	The Board unanimously ACCEPTED the final report of Task Force 78-A on "NSF and Support of Research and Science Education in the 1980's" (attached as Appendix B), which it had approved in principle at its 199th Meeting in June 1978.

202:29

APPENDIX B
(Attached to
NSB-78-490)

NSB-78-493

REPORT OF TASK FORCE 78-A

NSF and Support of Research and Science Education in the 1980's

as adopted by the National Science Board at its
202nd Meeting on November 16-17, 1978

AGENCY MISSION

The fundamental purpose of the National Science Foundation is to benefit the general welfare by fostering creativity in the pursuit of basic scientific understanding.

This fundamental purpose is enabled by support of:

1. Basic research in the physical, mathematical, biological, social, and other sciences and in engineering;
2. Science education and training to develop new scientific talent;
3. Applied research that links and develops knowledge in ways that enhance its usefulness;

4. Selected activities to improve the understanding of science and its use by all students and by the public;

5. Research resources (facilities) and institutional forms required in the conduct of research.

AGENCY GOALS

The goals of the National Science Foundation are to:

1. SUPPORT RESEARCH on (a) fundamental laws of nature, (b) man and his natural and social environment, and (c) technology-oriented sciences.

   - Provide SUPPORT to the highest quality researchers in areas with significant potential for advancing scientific understanding.

   - Provide RESEARCH RESOURCES AND EQUIPMENT demanded in the conduct of science.

   - Foster EDUCATION AND TRAINING to maintain U.S. scientific leadership in future generations.

2. ENHANCE RETURNS FROM NATIONAL INVESTMENT IN BASIC RESEARCH.

   - Encourage development in those areas of science with EXCEPTIONAL PROMISE for contributing to resolution of significant problems.

   - Foster greater COOPERATION within national and international communities.

3. IDENTIFY AND RECOMMEND NATIONAL POLICIES DESIGNED TO ENHANCE THE HEALTH AND VIGOR OF THE NATION'S SCIENTIFIC ENTERPRISE.

   - Provide INFORMATION AND ANALYSIS regarding national Science and Technology capabilities.

   - Recommend POLICIES designed to maintain a strong national research capacity.

4. MAINTAIN AND IMPROVE AGENCY EFFECTIVENESS AND RESPONSIVENESS.

   - Encourage EQUAL OPPORTUNITY for participation in science.

   - Foster greater PUBLIC UNDERSTANDING of science and the impact of science on public policy issues.

   - Improve AGENCY MANAGEMENT and ACCOUNTABILITY.

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

February 12, 1979

TO : Director

FROM : Chairman, National Science Board

SUBJECT: NSF Mission and Goals

At the June 1978 long-range planning meeting of the National Science Board, Task Force 78-A on "NSF and Support of Research and Science Education in the 1980's" examined objectives and strategies by which the National Science Foundation could best support scientific research and science education. It reviewed those factors expected to influence the conduct and support of science and science education in the 1980's and prepared a statement of NSF responsibilities as an executive agency of the Government in terms understandable to the general public and to those responsible for the allocation of public funds. This was done with a view to establishing a coherent set of agency objectives and strategies for use in formulating the NSF budget.

The final report of Task Force 78-A was unanimously approved by the Board at its 202nd Meeting in November 1978, and the statement is now available for distribution. Inasmuch as this statement elaborates the fundamental purpose of the National Science Foundation and articulates its goals, it is desirable to have it available to all those responsible for policy, planning, and budget activities in the Foundation.

Norman Hackerman

Attachment

LONG-RANGE PLANNING/STATUS OF SCIENCE REVIEWS

Task Force 78-C

Dr. Bisplinghoff, Chairman, presented the report of Task Force 78-C which included a commendation to the staff on the Status of Science document and suggested that the staff:

(1) Properly qualify the Status of Science document to indicate its restrictive nature and its use for internal planning purposes only;

(2) Make certain improvements in the document, including the incorporation of a Science Education section; and

(3) Continue and expand the analysis of NSF commitments, as presented on page C-5 of Volume III.

The Task Force also offered two recommendations for the Board's consideration:

(1) That the Board and staff review the present procedures for considering major budget items having open-ended large commitments with the view of early warning and better control of such long-term financial commitments; and

(2) That the Board encourage the authors of the special papers in Volume I, among whom are Shapley and Phillips, Manners and Nason, Kidd, and Mosher, to publish their papers in the open literature, such as Science, with appropriate reference to NSB/NSF.

At the conclusion of Dr. Bisplinghoff's presentation, and at the request of the Board Chairman, the Board took the following action:

NSB/Res-78-73 The Board unanimously AGREED to receive the report of Task Force 78-C.

The Board then acted on recommendation (1) as follows:

NSB/Res-78-74 The Board unanimously APPROVED the recommendation of Task Force 78-C that a review be carried out of the present procedures within the National Science Foundation for considering major budget items having open-ended large commitments with the view of early warning and better control of such long-term financial commitments.

Board action on recommendation (2) was as follows:

NSB/Res-78-75 The Board unanimously APPROVED the recommendation of Task Force 78-C that the National Science Board encourage the authors of the special papers in Volume I of the Planning Environment Review document, among whom are Mr. Willis H. Shapley and Mr. Don I. Phillips, Mr. George E. Manners, Jr., and Mr. Howard K. Nason, Mr. Charles V. Kidd, and The Honorable Charles A. Mosher, to publish their papers in the open literature, such as Science, with appropriate reference to the National Science Board and the National Science Foundation.

The final report of Task Force 78-C is attached as Appendix C.

199:16-17

APPENDIX C
(Attached to
NSB-78-294)

NSB-78-329

Report of

Task Force 78-C

NSB Long Range Planning Meeting

June 14-16, 1978

Item Reviewed: I. Status of Science Reviews

II. Flexibility Analysis

III. Status of Science Education Review

Status of Science Reviews (Volume II)

1. Staff should be complimented on Status of Science Reviews, and for achieving a higher degree of perfection upon already considerable refinement.

2. Better external labeling is required to show the restrictive nature of the document--preferably on the cover.

   In general, the Committee wishes to ensure that the document is qualified so as to make perfectly clear to the reader that the document is restrictive in character applying only to NSF Programs as an internal planning document.

3. New thrusts and opportunities should be qualified as referring only, for example, to chemistry as it is embraced by the Division of Chemistry in NSF and as they are perceived by the NSF staff. In addition, it should be pointed out that Chemistry is also funded by other Divisions such as Materials, etc. Similar comments may be made about other Divisions and we ask the staff to reexamine the whole document with this in mind.

4. The Task Force would like to see the manpower section illustrate what fraction NSF is contributing to total faculty support.

5. The Task Force recommends that the papers in Volume I be published in the open literature by their authors.

Flexibility Analysis (Volume III)

Degree of Freedom Analysis--NSF Program Dynamics

1. This kind of analysis is considered important by the Committee and should be pursued and perfected.

2. A greater analysis in depth of major items should be made in terms of:

   (a) Construction costs
   (b) Operating costs
   (c) Costs of supporting users

3. More thought should be given to the use that will be made of the flexibility analysis as a management tool. The data that should be compiled depends to a considerable extent on the management decisions that are to be made.

4. The committee believes that there are three levels of aggregation of flexibility analyses:

   (a) National level
   (b) NSF wide or Board level
   (c) Division or discipline level

5. Table on pg. C-5 gives a rough picture of the state of affairs as they exist at the present time. The Committee wishes to emphasize the importance of trends in these data. If possible, it is hoped that it will be possible to work backwards in time to develop trends.

6. In the Table on pg. C-5 under New Starts, it would be desirable to indicate what fraction involves new investigators.

7. In the Table on pg. C-5, it would be desirable to include trends in success ratios.

8. An estimate of continuing grant commitments in future years would be desirable.

9. The Committee suggests that the staff look at the possibility of differentiating trends in externally mandated items from internally mandated.

10. The Committee would like to see an estimate of what NSF resources are required to automate and obtain analysis and trends on flexibility.

11. Task Group C recommends that a review be carried out of Board and staff procedures for approving major items and making open-ended commitments. We understand that NSF staff is commencing a review. Board should follow their activities and develop its procedures to work in concert. For example, the Board would like to have early warning of significant major items and track them through their development.

Task Force C--Materials for Status of Science Education

1. Description of the research community in research on science learning. Strategies for building upon this base.
2. Sharpen up distinction between description of NSF's science education role and the whole system of science education.
3. Some attention to the role of other federal agencies in science education and points of coordination (NIE, NIH).
4. Attention to measures of outputs of science education.
5. Attention to data relevant to the role of NSF programs in producing "elite" scientists, versus the role of increasing science literacy among broad population groups.
6. Develop data on each Science Education program along the lines sketched out for the 5 programs. (Vol. III pp. C-SE-14-18).

. Include for each program, material on:

- Purposes
- Target group characteristics
- Performer characteristics including participation rates in proposals and awards
- Percent of target group reached and/or other impact data.

Prepared by Dr. Fred Betz
and Dr. Carlos Kruytbosch
Approved by Dr. Bisplinghoff,
Chairman, Task Force 78-C
July 26, 1978

199:26-28

APPENDIX A

Excerpt from Closed Session Minutes of the 204th Meeting on February 16, 1979, on the Basic Engineering Research Program of the Department of Energy

The Director reported on a recent briefing by the Director of Energy Research, Department of Energy (DOE) at which DOE's proposed increase in the area of basic engineering research for fiscal year 1980 was discussed. The Director proposed a statement commending DOE for its program in support of basic engineering research important to the success of many energy technologies and complementary to the broadly based engineering research program of the NSF.

The Board took the following action on the proposed statement:

NSB/Res-79-22/A	The Board APPROVED the statement which is attached to these minutes ...(NSB-79-87) commending the Department of Energy for the further development and support of its Basic Engineering Research Program.

Dr. Cooke abstained from voting on the above resolution.

NSB-79-87
(Revised)

NSB/Res-79-22/B

STATEMENT BY THE NATIONAL SCIENCE BOARD ADOPTED AT ITS 204TH MEETING ON FEBRUARY 15-16, 1979, ON THE BASIC ENGINEERING RESEARCH PROGRAM OF THE DEPARTMENT OF ENERGY

The National Science Board has encouraged mission agencies of the Federal Government to maintain strong basic research programs in areas that have the potential of contributing to their mission objectives over the long run. The Board most recently expressed this position in a resolution adopted at its 167th Meeting on October 18, 1974 (NSB-74-332).

The Board has been informed that the Department of Energy is proposing in the fiscal year 1980 budget and beyond to continue to support the Basic Research in Engineering Program in its Office of Energy Research. This program, initiated in fiscal year 1979, is recognized as applicable and important to the success of many energy technologies and is complementary to the broadly based engineering research programs of the National Science Foundation.

In light of the above, the National Science Board encourages the Department of Energy in the further development and support of its Basic Research in Engineering Program.

March 5, 1979

204:13-14

BIG AND LITTLE SCIENCE

Ad Hoc Committee on Big and Little Science--Fourth Meeting--May 17

Mr. Doan, Chairman, reported that the Ad Hoc Committee continued its discussion of big science in the hope of developing some information on the flexibility of NSF's granting procedures in terms of big science long-term funding and committed block grants. The Ad Hoc Committee referred to the Board a policy question on regranting authority to provide for making small grants to individuals at a rate of $300 to $1000 each for travel expenses, page charges, etc., from a "block" grant of $25,000.

After a brief discussion of the policy issue involved, the Board took the following action:

NSB/Res-79-45 The Board unanimously AGREED to receive the report of the Ad Hoc Committee on Big and Little Science regarding the proposal from the American Astronomical Society and to reserve action on the report until there has been adequate review of the proposal.

206:15

PREVENTING CONFLICTS OF INTEREST IN NSF SUPPORTED ACTIVITIES

The Director stated that in the Foundation's FY 1979 and FY 1980 appropriation Senator Proxmire, Chairman, Senate Committee on Appropriations, directed NSF to require principal investigators to disclose consulting relationships that could create conflict of interest situations. The Director referred to a memorandum from him to the Board (NSB-80-154--Members' Books, Tab B) which explained the Foundation's partial response thus far to the Senator's request and recommended additional action by the Foundation, by way of a proposed draft Important Notice which was attached to NSB-80-154. This document was subsequently revised and redistributed via NSB-80-184. The revised document contained a draft Important Notice which would be submitted to the Federal Register and disseminated to the scientific community for comment. The issuance of the Important Notice would depend on the response from the Federal Register announcement, including the response from the scientific community. The Director also proposed in NSB-80-184 that the Board adopt a policy statement on this subject by adopting a resolution contained therein.

At the Director's request Dr. Mac Lane drafted an alternative resolution for the Board's consideration (NSB-80-185--distributed at the meeting). A lengthy discussion ensued regarding the language to be contained in the proposed Board policy statement, primarily to ensure that the meaning of "conflict of interest" would be clearly defined and thus understood by all parties concerned. It was determined that a Board policy statement, accompanied by a Background Statement, would be an appropriate response to the Congress on this issue, rather than publication of the proposed Important Notice in the Federal Register.

Following discussion of and revisions to the proposed Board policy statement, the Board took the following action:

NSB/Res-80-39/A The Board unanimously ADOPTED a Policy Statement on Conflicts of Interest in NSF-Supported Activities which is attached to these minutes, along with a Background Statement, as Appendix B.

215:8

APPENDIX B
(Attached to
NSB-80-192)

NSB/Res-80-39/B

NATIONAL SCIENCE BOARD POLICY STATEMENT ON CONFLICTS OF INTEREST IN NSF-SUPPORTED ACTIVITIES UNANIMOUSLY ADOPTED AT ITS 215TH MEETING ON APRIL 17-18, 1980

Many research workers with National Science Foundation (NSF) grants or contracts also participate in consulting and entrepreneurial ventures. Those activities can encourage transfer of basic knowledge to applications, develop vital linkages between universities and industries, and help researchers maintain a breadth of knowledge in their fields.

Such activities are, therefore, generally encouraged. However, abuses may arise when conflicts of interest lead to distorting the research work outside the context of the proposal, to diverting material, facilities, or effort for private gain, or to withholding from general availability the final results of NSF-sponsored research.

To prevent such abuses the National Science Foundation has stated policies and procedures and further urges institutions which may receive NSF grants to establish their own.

The best protection of the public interest, however, is sensitivity on the part of the principal investigator to the possible appearance of abuse. When in doubt, the principal investigator should report the circumstances to the institution and to the National Science Foundation.

BACKGROUND

The National Science Board has considered various specific mechanisms to provide for disclosure of possible conflicts of interest in every National Science Foundation grant or contract. In our judgment, no such provision will succeed in really disclosing the rare cases of real abuse, and every such provision is likely to be confusing. The situation is very different in different fields of science and in different universities.

In examining possible conflicts of interest, principal investigators should be especially aware of overlapping financial interests which might (or might seem to) divert public funds to private interest, and of instances where consulting arrangements might (or might seem to) influence the direction or the interpretation of the research outside the context of the original NSF grant or contract.

It is thus our view that any explicit regulation or record of potential or actual conflict of interest should be administered directly by the institution concerned.

Many universities and colleges have adopted the basic principles enunciated in 1964 by the Council of the American Association of University Professors and the American Council on Education in a joint statement "On Preventing Conflicts of Interest in Government-Sponsored Research at Universities." This statement identified potential conflict situations to be recognized by universities engaged in Government-sponsored work and enumerated the responsibilities of the universities to act to avoid such problems. The statement recognized, in brief:

> The Government and institutions of higher education, as the contracting parties, have an obligation to see that adequate standards and procedures are developed and applied; to inform one another of their respective requirements; and to assure that all individuals participating in their respective behalfs are informed of and apply the standards and procedures that are so developed.

A statement of "Principles to Govern College and University Compensation Policies for Faculty Engaged in Sponsored Research," was prepared in April 1978 by a task force sponsored jointly by the Association of American Universities, the American Council on Education, and the National Association of State Universities and Land Grant Colleges and endorsed by them later in 1978. Specifically, the 1978 statement recommended that each institution establish and disseminate policy on consulting that requests faculty engaged in sponsored research to inform and confer with appropriate institutional officers on the nature and extent of consulting that could impair or conflict with the individual's responsibilities to granting agencies, with the expectation that universities and college officers will provide granting agencies proper notice.

215:19-20

SAFETY OF RESEARCH

RECOMBINANT DNA RESEARCH

The Chairman called attention to the proposed revision of the guidelines on recombinant DNA research developed by the National Institutes of Health (NIH), which had been mailed to the Board on November 2 (NSB-77-441). He noted that in August 1976 the Board had adopted as policy for the Foundation the applicable portions of the original NIH guidelines of June 1976, as published in the Federal Register on July 6, 1976.

Dr. Rich stated that he was drafting a resolution for consideration by the Board later in the day proposing a Board position on the revised guidelines.

Dr. Rich distributed a draft resolution proposing that the Foundation endorse the process by which the NIH updated the guidelines on the conduct of recombinant DNA research and the activity carried out by NIH to publicize the proposed revisions.

In the brief discussion which followed, it was noted that the proposed resolution was consistent with the August 1976 action of the Board at which time it was stated that the guidelines were in constant evolution as new understanding is developed.

The Board unanimously ADOPTED the proposed position on the revised draft guidelines on recombinant DNA research, as set forth in Appendix B.

APPENDIX B
NSB-77-464

November 17, 1977

RESOLUTION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS ONE-HUNDRED AND NINETY-FOURTH MEETING ON NOVEMBER 17-18, 1977

The National Science Board unanimously requested that the Director of the National Science Foundation convey to the Director of the National Institutes of Health its endoresment of the process used to update the guidelines for the conduct of recombinant DNA research. The original guidelines were developed on the basis of scientific information available approximately two years ago. The proposed revisions have been developed on the basis of new information accumulated during the intervening period, in particular, those concerning the biology of organisms containing recombinant DNA molecules and the effectiveness of biological and physical containment Reassessment will undoubtedly be needed again in the future as new knowledge becomes available, as cited in the earlier resolution of the Board.

The Board also endorsed the activity carried out by the National Institutes of Health in widely publicizing the proposed revisions in such a way as to ensure full participation of scientific, industrial, agricultural, environmental, and other concerned public groups in the process.

The National Science Board looks forward to continuing cooperation with the National Institutes of Health in this area of mutual concern.

194:4
194:29
194:32

TOXIC CHEMICALS

Dr. Pimentel brought to the Board's attention the fact that regulations were being prescribed by the Occupational Safety and Health Administration (OSHA) for the handling of toxic chemicals in working spaces which could include academic research and teaching laboratories. It was agreed that these regulations could have adverse effects on such laboratories and may be too restrictive in these areas where hundreds of chemicals are used daily by knowledgeable people. At the request of the Director of NSF, NAS has undertaken an investigation into appropriate research laboratory precautions. Following a brief discussion, the Board took the following action:

NSB/Res-79-26/A The Board unanimously APPROVED a resolution, attached as Appendix A, recommending a temporary exemption of academic research and teaching laboratories from the proposed regulations by the Occupational Safety and Health Administration covering toxic chemicals.

APPENDIX A
NSB/Res-79-26/B

NSB-79-130

STATEMENT BY THE NATIONAL SCIENCE BOARD UNANIMOUSLY ADOPTED AT ITS 205TH MEETING ON MARCH 15-16, 1979, ON PROPOSED REGULATIONS BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION ON TOXIC CHEMICALS

Regarding the proposed regulations by the Occupational Safety and Health Administration (Title 29 CFR Part 1990 - Identification, Classification, and Regulation of Certain Toxic Substances) devised for the control and monitoring of toxic chemicals primarily with industrial settings in mind:

Several thousand colleges and universities in the country use these substances under circumstances very different from those for which the regulations were intended. Dispersed groups of students and faculty in a multitude of disciplines such as chemistry, biology, physics, medicine, dentistry, home economics, geology, and agriculture under disparate conditions may be involved from time to time.

In view of the belief that safety considerations imposed by these proposed regulations may not be effective or appropriate for research and teaching laboratories, and

In view of the potentially adverse impacts, including large costs, on research and teaching laboratories of implementing these proposed regulations,

Therefore, the National Science Board recommends that a temporary exemption from these proposed regulations be granted to research and teaching laboratories pending completion of the study by the National Academy of Sciences now underway relating to additional appropriate safety conditions for these laboratories.

March 15, 1979

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

NSB-79-171

April 24, 1979

MEMORANDUM TO MEMBERS AND CONSULTANTS OF THE NATIONAL SCIENCE BOARD

Subject: Proposed OSHA Regulations on Toxic Chemicals

The Board at its 205th meeting on March 15-16, 1979 adopted a statement setting forth its position on the proposed regulations of the Occupational Safety and Health Administration (OSHA) on the control and monitoring of toxic chemicals.

On April 11 the Director wrote to the Secretary of Labor regarding the Foundation's position on this subject and transmitted a copy of the Board's statement. Attached is a copy of that letter (the attachments are available upon request from the Board Office).

V. Anderson
Vernice Anderson
Executive Secretary

Attachment

APR 11 1979

Honorable F. Ray Marshall
Secretary of Labor
Washington, D.C. 20210

Dear Mr. Secretary:

In my letter of December 19, 1978, to Eula Bingham (copy attached as Tab A), I urged that the final version of proposed 29 CFR Part 1990, "Identification, Classification, and Regulation of Certain Toxic Substances," exempt research and teaching laboratories. I remain firmly convinced that applying standards to laboratories based on the models in the proposed regulations will have an extremely adverse impact on scientific research in this country. Indeed, I believe the consequences of the issuance of the regulations in their present form will be even more serious than I recognized at the time of my prior letter. On the other hand, it is the impression of many persons who attended a meeting on January 8, 1978, between Eula Bingham; Dr. Handler of the National Academy of Sciences; Dr. Pimentel, the Deputy Director of NSF; and others that OSHA remains uncertain whether it will be able to grant an exemption.

Now, the National Science Board, the governing body of NSF appointed by the President, has also considered the suitability of the proposed standards. Their deliberations led to a unanimous resolution recommending a suspension of application of these standards to research and teaching laboratories pending the outcome of further study now in progress of this issue (see Tab B). It seems that there is a general consensus that these standards would have minimal beneficial effects on safety in these settings but would seriously impede research progress and teaching effectiveness. Hence, it would be most unfortunate if the OSHA decision preceded receipt of the results of a National Academy of Sciences study which is just beginning. The purpose of this study is to establish a sound basis for comprehensive safety standards for the handling of chemicals in the research and teaching laboratory setting.

We believe the record will support the type of temporizing action that we propose. At Tab C, we have included copies of documents found in the record of the proceeding and other pertinent correspondence submitted to OSHA during the rule-making period which we believe cannot be ignored and which provide a basis for suspension of the application of the regulations as to usage of toxic substances in laboratories. The Department of Labor's own regulatory analysis indicates that the issue was raised and had to be addressed (see Tab D where pp. 66 and 67 are reproduced). Furthermore, Item #281, prepared by Glen E. Schweitzer at Cornell University, contains some factual information on the likely impact these regulations would have on the conduct of scientific research, particularly with respect to the probable discontinuance of some lines of research.

Again, I urge you to adopt the recommendation of the National Science Board and suspend the application of any standards issued under the procedures of proposed 28 CFR Part 1990. The requirements that would be involved would not be effective but they would be so costly as to require many laboratories to discontinue experimentation involving the use of substances subject to the standards. This would obstruct and distort scientific research in this country and in the long run will pose another kind of danger to the public health and to the economic and technical vitality of our nation. At Tab E we have included language to amend the proposed regulation that we believe represents a reasonable approach and that will accommodate the various concerns that have been expressed.

This important matter deserves your personal attention to avoid a major disagreement between OSHA and the research community.

Sincerely yours,

Richard C. Atkinson

Richard C. Atkinson
Director

Copy to: Eula Bingham/OSHA
Tom Hall/OSHA
Grover C. Wrenn/OSHA
Frank Press/OSTP
Eve Katz/AAU
William Spindel/NAS
Phillip Handler/NAS
Donald Fredrickson/NIH
Sheldon Steinbeck/ACE

bcc: Dr. Hackerman/NSB
Dr. Pimentel/OD
Dr. Nicholson/CHEM
Dr. Clark/BBS
Dr. Krumhansl/MPE
Dr. Wilson/PRM
Mr. Lasken/OGC

OGC:JELasken:OD:GCPimentel:jmu

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS

The Board Chairman referred to a memorandum to the Board from Dr. Rich (NSB-80-101--distributed at the meeting) proposing that the Board establish an ad hoc committee with external members to keep the Board informed of studies and developments relative to OSHA regulations concerning the use of toxic chemicals in academic and industrial research laboratories and in educational teaching laboratories. The Chairman then called on Dr. Rich to introduce his proposal.

Dr. Rich stated that OHSA will be issuing regulations that will significantly modify the conduct of research in laboratories. OSHA has requested comments from external sources on the substances to be regulated and the manner in which this will be accomplished. The issue has three components: (1) legal aspects; (2) "chemical apsects"--identifying the chemicals in question and their use; and (3) the aspect of carcinogenesis--what studies have been done and the degree of carcinogenicity of different compounds as they are used.

Dr. Rich noted that ongoing studies are being generated by NAS and the National Institutes of Health (NIH) on the OSHA regulations. He did not recommend that the Board conduct a study but rather that it establish a group that will survey the present activities of the Federal Government and inform the Board. He suggested that the Board might wish later to issue a statement with recommendations, perhaps supporting the recommendations of NIH.

A discussion took place regarding Dr. Rich's proposal. The Board was clearly in agreement that it should actively participate in a timely way in expressing views on the OSHA regulations. It was noted that the Board issued a statement on this subject at its 205th Meeting on March 15-16, 1979 (NSB-79-130). The Director transmitted the Board's statement to the Secretary of Labor on April 11, 1979.

The General Counsel informed the Board that the Foundation has been following this issue. Further NIH has established an interagency task force, of which OSHA is an observer, to develop guidelines for the protection of employees from exposure to carcinogens used in NIH laboratories. NIH expects that its task force will eventually develop guidelines that will assist OSHA in applying regulations to specific carcinogens found in other research laboratories. The NIH activity, which has been ongoing for some time, initially addressed standards for NIH laboratories only, but that once established they might be extended to other facilities. He then recommended that the Board assist in the development of the NIH guidelines that are presently in draft form.

Following this discussion the Board Chairman assigned the Committee on Role of NSF in Basic Research the task of determining what is needed in the way of external or NSF staff assistance in order for the Board to keep informed of studies and developments, and thus to enable the Board to advise OSHA on its regulations regarding the use of toxic chemicals. He requested the Committee to bring its recommendations to the Board at the next meeting.

The General Counsel stated that he would provide this Committee with the draft NIH guidelines and would brief the Committee on actions to date.

GEOGRAPHIC DISTRIBUTION

PLANNING AND POLICY COMMITTEE--FORTIETH MEETING--JANUARY 28

Dr. Reynolds, Chairman, reported on the status of three items which were discussed: (a) geographical distribution, (b) indirect costs, and (c) the Planning Environment Review, as follows:

> (a) Geographical Distribution
>
> In House Report 94-99, March 1975, the Committee on Science and Technology expressed concern about an apparent concentration of NSF research funds in a relatively small number of states and institutions. The National Science Foundation Act of 1950 requires that awards are to be made so as to avoid undue concentration of research and education and to strengthen research capabilities throughout the Nation. The House Committee requested that the Foundation and the Board (i) review their policies regarding the application and implementation of these requirements, (ii) submit a report to the Board on how these requirements are being applied to the award selection process, and (iii) submit the results of the review to the Committee on Science and Technology as soon as the report has been completed.

The Committee reviewed a draft of the position paper on geographical distribution (NSB/PPC-77-5); revisions are now being made in the draft by the staff.

Dr. Reynolds, at the request of the Board Chairman, reported on the following conclusions of the draft report, not all of which were agreed to:

> (i) Federal research and development funds in general, and NSF in particular, are awarded on the basis of perceived scientific competence. To the extent that geographic concentration exists, it is the unintended consequence of a policy to place money where the best performers are located.
>
> (ii) In the case of research and development conducted in universities and colleges, the best performing scientists, engineers, and academic institutions are geographically concentrated as a result of a series of geographic, economic and social, and political factors which are slow to change significantly.
>
> (iii) The present distribution of NSF project support for basic research reflects a number of judgments and tradeoffs. Any substantial policy change to tilt it more in the direction of strictly geographic considerations would not significantly alleviate the

present conditions leading to concentration and would reduce the Foundation's ability to fund the highest quality research at a time when Federal funding of basic research has been declining in constant dollars.

(iv) The present concentration of research support in a relatively small number of institutions and states is of concern to the Board. This situation can only be alleviated through a commitment by the Congress and the Administration to a sizeable, long-term institutional support program targeted at strengthening academic science departments and universities on a geographically dispersed basis. Such a program would need to be coordinated closely with state and university officials.

The Committee agreed that the statement in conclusion (ii), that geographic, economic and social, and political factors are slow to change significantly, is incorrect, since the factors involved are changing more rapidly than are the institutions.

The Committee concluded that the term "undue" is vague and suggested that it be defined in terms of the societal objectives of NSF or the societal objectives that motivate the Federal Government to support science.

Conclusion (iv) was not accepted by the Planning and Policy Committee which remanded it to the staff for revision.

Dr. Reynolds indicated that the revised draft would be submitted to the Board at its March meeting. 187:15-17

PATENT POLICY

PATENT POLICY

Dr. Cooke, Acting Chairman, reported that the Planning and Policy Committee had considered carefully the updated patent policy proposed by the Director to be followed by the Foundation regarding rights to inventions made under or during the course of NSF awards (as outlined in NSB-73-62--Members' Books, Tab C). The Committee recommended two changes in the Director's proposed statement: substitution of new paragraph 5(b) (distributed at the meeting) and a change in paragraph 6 as follows:

> Institutional agreements will also require that the institution use any net royalty income retained by it from such inventions for the support of ~~scientific research or education~~ education or scientific research.

The General Counsel indicated that such a change in paragraph 6 might open the Foundation to congressional criticism that the Foundation is not taking the necessary precautions to guard fully the public's interest in inventions made with NSF support. After the Board voted seven yeas and eight nays to accept the original language of the statement, the Board acted as follows:

> The Board ADOPTED the statement of patent policy as set forth in NSB-73-62, with amendments proposed by the Planning and Policy Committee (final text attached as Appendix B).

Three Board Members abstained from voting on the above resolution; no negative votes were cast.

ES:154:7-8

March 15-16, 1973.

APPENDIX A

NATIONAL SCIENCE FOUNDATION
PATENT POLICY

1. Coverage

This policy applies to all grants, contracts, and other arrangements entered into by the National Science Foundation. The term "award" shall be taken to include any and all of these arrangements, and the term "grantee" shall include contractors and other recipients of other awards.

2. Awards Not Subject to Patent Provisions

Foundation awards which are not made for the purpose of supporting experimental or research work, or which do not contain a significant element of any such activity, need not be subject to provisions dealing with the rights to inventions made thereunder. (Some examples of such awards include facilities and equipment grants, institutional grants, summer institutes, travel and conference grants, etc.)

3. Awards Subject to Patent Provisions

Foundation awards which are made for the purpose of supporting experimental or research work or which contain a significant element of any such activity will contain appropriate provisions dealing with rights to inventions made thereunder. (Some examples of such awards include scientific research project support grants, student originated studies, other research awards, etc.) Suitable provision shall also be made to govern disposition of inventions made by subcontractors wherever such a clause appears in the primary award. All patent provisions and all determinations of disposition of rights in inventions shall comply with paragraph 7 below.

4. Patent Provisions

a. The Foundation will use a deferred determination provision in every award relating to experimental or research activities except where: (1) the award is subject to an institutional agreement entered into by the Foundation pursuant to paragraph 6 below; (2) the Foundation has agreed pursuant to a request, and after negotiation, that rights to inventions be determined at the time of the award, as provided in paragraph b below; (3) the award is for an NSF fellowship or traineeship, as provided in paragraph c below; or (4) the contract is for operation of a national center, as provided in paragraph d below.

b. Where the purpose of the grant is to build upon existing knowledge and the work called for in the grant is in a field in which the grantee has acquired technical competence and a commercial position, and the grantee asks that rights to inventions be determined at the time of the award, the Foundation will negotiate special patent provisions which may grant rights to the grantee greater than a revocable nonexclusive license. Such special provisions may also be negotiated at the time of award with academic or other nonprofit institutions having a demonstrable capability for effective patent management. In these negotiations the Foundation will take into consideration Section 12(a) of the NSF Act and the President's Statement of Government Patent Policy[1] including particularly consideration of such factors as the nature and purpose of the project, the position of the grantee in the subject technical field, and the contributions to the project work made by the grantee. Such provisions may require the grantee to license such inventions in accordance with the provisions of paragraph 5(b) and/or furnish necessary technical data and other rights in accordance with paragraph 8.

c. Foundation awards for graduate fellowships and traineeships will require only that the Government receive a royalty-free license with march-in rights under any patents resulting from the individual's work during the period of NSF support.

d. Title to inventions made at NSF-supported national research centers shall normally vest in the Government.

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[1] Issued by President Nixon on August 23, 1971.

5. Deferred Determination of Rights

a. When the Foundation provides for deferring the determination of rights in inventions until such time as an invention has been identified and reported, it will make its determinations on the basis of consideration of such factors as (1) the nature and purpose of the project, (2) the commercial position of the inventing organization in the subject technical field, (3) the contribution of the grantee to the cost of the invention, (4) the need for Government control of the invention, (5) the intention and capability of the inventing organization effectively to bring the invention to the point of practical application, either by itself or through an invention or patent management organization, and (6) the degree of domination by and extent of availability of background patents controlled by the grantee.

b. In cases where title to an invention is left with a grantee which itself is not expected to develop and use the invention, the Foundation will require the licensing of such invention on a nonexclusive basis to all qualified applicants: Provided that an exclusive license may be granted if the grantee determines that an exclusive license is necessary as an incentive for development of the invention or where market conditions are such as to require licensing on an exclusive basis. Any such exclusive license will normally be for a limited period of time less than the life of the patent such as three years from the first commercial use or sale or eight years from the inception of the license agreement, whichever first occurs. Thereafter, additional licenses will be made available nonexclusively unless the original period is extended with approval of the Foundation.

c. Where the grantee does not wish to retain title to the invention and neither NSF nor any other Government agency wishes to take title, the invention may be left with the individual inventor on terms which are reasonable in the circumstances, on a showing that he wishes to and has the ability to bring the invention to the marketplace by his own efforts or the efforts of licensees, or if more appropriate it may be dedicated to the public by publication.

6. Institutional Agreements

The Foundation may enter into separate institutional agreements with academic or other nonprofit organizations which are capable of aggressively promoting the use of inventions and have competent patent counsel available and an active ongoing program of patent management. Such agreements may provide that all inventions made under NSF awards belong to the grantee subject to the rights specified in paragraph 7 below, and the limitations on licensing specified in paragraph 5(b). Institutional agreements will also require that the institution use any net royalty income retained by it from such inventions for the support of education or scientific research. These agreements will provide that individual awards or categories of awards may be excluded from the coverage of the agreement at the time of award when special treatment of possible inventions appears appropriate to NSF.

7. Minimum Government Rights

In all cases where an award is subject to patent provisions and the grantee or any other party has been allowed to retain principal rights in inventions, whether at the time of award or after the invention is identified, at a minimum, the Foundation shall reserve the following rights:

a. License Rights

(1) A nonexclusive, nontransferable, paid-up license under the inventions in favor of the Federal Government and state and domestic municipal governments, unless it is determined that it would not be in the public interest to acquire the license for the state and domestic municipal governments;

(2) The right to sublicense any foreign government pursuant to any existing or future treaty or agreement if it is determined it would be in the national interest to acquire this right; and

(3) The principal or exclusive rights to the invention in any country in which the grantee does not elect to secure a patent.

b. "March-in" Rights

(1) The right to require the granting of nonexclusive or exclusive licenses to responsible applicants on terms that are reasonable in the circumstances, unless the grantee has taken effective steps within three years after a patent issues on the invention to bring the invention to the point of practical application or can show cause why he should retain the principal or exclusive rights for a further period of time.

(2) The right to require the granting of nonexclusive or exclusive licenses to responsible applicants on terms that are reasonable in the circumstances (a) to the extent that the invention is required for public use by governmental regulations, or (b) as may be necessary to fulfill health or safety needs, or (c) for other public purposes stipulated in the grant.

8. Availability to the Public of Research Results

A major objective of the Foundation's patent policy is to encourage the use of inventions arising out of activities supported by the Foundation. It is important where a grant is for research to assure that any useful product or process developed or improved under the grant is made available to the public on reasonable terms. Industrial or commercial organizations may be permitted to retain title to inventions as provided for in Section 1 of the President's Statement; however, either at the time of contracting, or of determining disposition, such an organization may be requested to furnish to responsible applicants technical data and any other rights which it is able to provide, to the extent necessary to make the product or practice the process concerned, where such organization is not in a position to, does not desire to, or otherwise will not make available to the public the products or the advantages of using processes developed or improved under the grant.

APPENDIX C

COMMENDATION TO DR. THOMAS B. OWEN

The National Science Board notes with regret that on July 14, 1974, Dr. Thomas B. Owen resigned from his post as Assistant Director for National and International Programs of the National Science Foundation. Dr. Owen joined the Foundation staff in June 1970 to head the newly formed Directorate of National and International Programs.

During his tenure he molded the Directorate into an organization which now provides services to science on national and international scales, in subject areas almost as diverse as the whole of science. Having assumed the responsibility for the operation of the Foundation's existing large programs such as the National Center for Atmospheric Research and the Kitt Peak and Cerro Tololo observatories, this Directorate went on to develop a number of new multi-institutional, world renowned programs which include the International Decade of Ocean Exploration, the Very Large Array radio telescope, and the upgrading of the world's largest radio telescope in Arecibo, Puerto Rico.

Through its Office of Polar Programs the Directorate assumed complete management responsibility for the entire United States program in Antarctica, and also effected a major extension of research on the environment and resources of the Alaskan Arctic.

With keen insight Dr. Owen brought a sense of continuity and organization to a Directorate which is characterized by the diversity of its responsibilities. His highly developed management skills have enabled him to gauge the appropriate level of management oversight over large programs in order to provide maximum research freedom for participating scientists, while achieving the overall program objectives.

The Board expresses its deep appreciation for these and other services which Dr. Owen has rendered to the Foundation and wishes him well in his new role at American University.

September 20, 1974

ALAN T. WATERMAN AWARD

The Board discussed the relative merits of the above proposals and their various combinations, and finally decided that the fellowship award and the medal should be combined as follows:

> In recognition of the distinguished service of the Foundation's first Director, the Board unanimously AUTHORIZED Dr. Stever to create a program of Alan T. Waterman distinguished awards for scientific research or advanced scientific study for up to three individuals under 40 years of age with support up to $50,000 annually for three years and the award of an Alan T. Waterman medal.

The Director agreed to seek congressional and OMB approval to this plan, hoping that a public announcement could be made at the May 15 anniversary dinner.

ES:172:10

ALAN T. WATERMAN AWARD

It was proposed that an award committee be appointed consisting of 12 appointed members and three ex officio members (Board Chairman, Director, and President of National Academy of Sciences). Following a brief discussion of this award as tribute to the first Director of the Foundation in its 25th year, the Board acted as follows:

> The Board unanimously AUTHORIZED the inauguration of the Alan T. Waterman Award as provided for in P.L. 94-86, and further AUTHORIZED the Chairman and the Director to appoint an Alan T. Waterman Award Committee and to make appropriate administrative arrangements for its support.

175:21

REPORT OF ALAN T. WATERMAN AWARD COMMITTEE

The Board Chairman referred the Board to the 1980 report of the Alan T. Waterman Award Committee (NSB-80-160--Members' Books, Tab C) submitted to him by Dr. John T. Wilson, Chairman, in a letter dated March 27, 1980. The report contained two recommendations for Board action:

a. that the statement in the solicitation letter concerning the age requirement be expanded, as follows: ". . .must be 35 years of age or younger, or not more than 5 years beyond receipt of the Ph.D. degree, by December 31 of the year in which nominated"; and

b. that the Foundation initiate steps to increase the number of awards from one to three of equal stature and in different disciplines.

The Board considered the report and the recommendations therein and acted on the first recommendation as follows:

NSB/Res-80-40 The Board unanimously ACCEPTED the recommendation contained in the 1980 report of the Alan T. Waterman Award Committee that the age requirement be expanded as follows: ". . .must be 35 years of age or younger, or not more than 5 years beyond receipt of the Ph.D. degree, by December 31 of the year in which nominated."

With respect to the second recommendation it was noted that congressional legislation would be required to increase the number of awards. In addition, although the Board recognized the difficulty involved in selecting only one awardee from the many qualified candidates, especially from varying disciplines, it was the sense of the Board that the number of awards should not be increased as such action would detract from the special nature of a single award.

Also, in the course of the discussion it was recommended, and the Board agreed, that the requirement in the draft soliciation letter for six copies of each nomination be deleted.

VANNEVAR BUSH AWARD

At the January meeting the Board considered a recommendation by the Executive Committee to accept the Director's recommendation to establish a Vannevar Bush Award. Following discussion at that meeting, a motion was passed to table the proposed Award to allow the Board time to consider it. The Chairman informed the Board that Dr. Zumberge had written him on February 4 to reiterate his support for the concept of the Vannevar Bush Award and to request that consideration of the Award be reopened at this meeting. The Chairman referred the Board to the Director's memorandum of January 17 containing a proposal for the establishment by the Board of a Vannevar Bush Award and also to Dr. Zumberge's letter to him dated February 4 (NSB-80-33--Members' Books, Tab B). Following a brief discussion the Board acted as follows on the resolution proposed in NSB-80-33:

NSB/Res-80-19

The National Science Board AUTHORIZED the establishment of a National Science Board "Vannevar Bush Award" to be conferred from time to time on a person who has made an outstanding contribution to science and technology through public service to the Nation; further, the Board AUTHORIZED the Chairman, National Science Board, in consultation with the Director to make appropriate administrative arrangements for the support of the Vannevar Bush Award, to expend the necessary funds to design and strike a medal, and to appoint an appropriate body to bring recommendations to the Board at its March 1980 1/ meeting for the first Vannevar Bush Award to be conferred in May 1980.

BOARD POSITIONS ON LEGISLATION

APPLIED RESEARCH

The Director informed the Board of his plans to implement P.L. 90-407 which authorizes a broadening of the Foundation's responsibility to support applied research. Under Section 3(c) of the amended NSF Act, "...the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other non-profit institutions." The Foundation proposes to announce soon to the educational and scientific communities through an "Important Notice" its plans in this regard.

> The Board unanimously CONCURRED in the Director's plans to proceed with the support of applied research on a limited basis as outlined to the Board at this meeting.

120:7

BOARD POSITION ON S. 32

Dr. Cooke presented for Board consideration a proposed Board position on S. 32. In the Committee's discussions it recognized that S. 32 has become a generic name for a number of more or less similar bills (including H.R. 32) which contain different detailed provisions; hence, a well defined position on the titles of S. 32 would provide an adequate Board position on any of the related bills.

The Committee discussion focused on Title II of S. 32--The Civil Science Systems Act--as being the most controversial in relation to the Foundation.

In addressing each title:

Title I: The Science Policy Act--The principle of Title I has already been initiated by the President's proposed Reorganization Plan No. 1 of 1973 which, in fact, assigns the science policy responsibilities of Title I to the Director of the National Science Foundation.

The primary objection to Title I in the 1972 hearings was based on the existence of OST and the conflict between the role assigned to the Foundation by Title I and the role of OST. . . .Since the Executive reorganization proposed the abolishment of OST, that problem is resolved. The basic position of the Board then should be even stronger than that presented in last year's testimony when ". . . the Board approved the intention of Title I to strengthen the role of the National Science Foundation in the development of national science policy." Although the details of the implementation of Reorganization Plan No. 1 of 1973 are not yet complete, the Committee recommended that the Board assume a positive, confident position, supporting the Director in the role proposed by the Plan.

Title II: The Civil Science Systems Act--The Board should oppose this Title in its present form. As it is now written, it asks the Foundation to undertake too large a task, in terms of both size and scope. It is unreasonable to ask any one agency to take a lead role in major development and demonstration projects in the wide range of areas proposed in this Title; and the likelihood of success in such a broad undertaking is small.

If the Foundation were to undertake the task, it would greatly distort the Foundation and would almost definitely overshadow and conflict with its basic mission. Administratively, it would assign NSF responsibilities in activities of existing Federal agencies and would make NSF in part responsible to the congressional committees with oversight for these agencies.

The Committee recognized the Board's concern for effective utilization of science and technology in meeting the needs of the civilian sector but felt that a more desirable approach is strengthened programs within the agency of primary responsibility.

The Committee recommended as a "fallback" position the following:

The Foundation's RANN Program selectively supports research, including systems research, in a number of problem areas through the proof-of-concept phase. In selected areas this activity could be strengthened and carried through the demonstration and evaluation stages again using the RANN criteria for selecting a limited number of projects in particularly appropriate areas. However, . . . the Board would be concerned with the possible effects the operation of such development and demonstration projects might have on other NSF programs.

If the trend towards a more centralized locus of responsibility for civilian science is desirable, then a better approach might be the modest expansion of RANN in the manner described above as a test of the approach and a first step towards centralization. (This is basically the position of the Board as stated in the 1972 hearings.)

Title III: The Technical Manpower Transition Act--Title III should be opposed by the Board. In addition to being on uncertain ground in terms of need, unemployment among scientists and engineers was never as high as among the general population and has been declining during the past year. Support of this Title would conflict directly with the Board's position on the need for expanded educational opportunities and encouragement for students to select scientific careers. The Board appreciates the loss, both personal and to the Nation, which unemployment among scientists and engineers represents but believes that programs designed to advance science and its utilization are a more appropriate solution than programs which are primarily addressed to job creation or retraining via technology.

Title IV: The Protection of Pension Rights of Scientists and Engineers--Title IV is supported in concept by the Board but is not an appropriate responsibility for the Foundation to undertake. The pension rights of all workers (not solely scientists, engineers, and related workers) should be protected. An appropriate solution to this problem for scientists and engineers should be found as a part of the larger solution developed by a more appropriate agency, such as the Department of Labor.

In the discussion which followed, it was the consensus of the Board that it was in general agreement with the recommendations outlined by the Planning and Policy Committee. The Board proposed that a more positive position be taken on Title II, specifically that the last two paragraphs be proposed as an alternative to the present language of Title II of the bill. It was also suggested that Board Members be modestly constructive and positive on S. 32 type bills in any public statements. It was agreed that those positive aspects of the Board's position should be stressed. In addition to those mentioned above, these included:

1. The Foundation has access to a large community upon which it can draw easily which has not been utilized adquately to date.

2. The Foundation could assist in the solution of many kinds of problems--some of high technology, others of low technology.

3. There are those activities which relate to small business, many of which are incapable of mounting research programs in any reasonable degree. In many instances NSF could assist by providing appropriate links to the scientific community nearby.

Among the items on the negative side were:

1. Very large systems are beyond the current capabilities of NSF.

2. It is the total budget that counts. If the "cheap" money drives out the "hard" money, in the long term the national interest will not be well served. It is this aspect which gives the Board very serious concern.

The Acting Committee Chairman accepted the amendments to the Committee's recommendations, after which the board acted as follows:

> The Board unanimously ACCEPTED
> the amended recommendations of
> the Planning and Policy Committee
> as the Board's position on S. 32.

The Board Chairman requested the Acting Committee Chairman to work with the staff in converting the amended recommendations and the sense of the Board discussion into a formal policy paper for use in testimony before congressional committees on S. 32. The Board Chairman suggested that other Members be guided accordingly if asked to appear on behalf of the Board.

ES:153:10-13.

BAUMAN AMENDMENT

Fifth Meeting--May 14--Dr. Press, Chairman, reported that the Committee discussed implications of amendments to the House-passed version of the NSF authorization bill.

The Committee proposed a resolution stating the Board's position on H.R. 5796, introduced by Representative Charles E. Bennett (D.-Fla.), and Section 7 of H.R. 4723 (the House authorization bill) which had been proposed by Representative Robert E. Bauman (R.-Md.). After discussion and amendment, the Board passed the resolution in the form attached as Appendix A.

173:6

APPENDIX A
(Attached to
NSB-80-241)

May 9, 1980

MULTI-YEAR FUNDING FOR R&D

Honorable Don Fuqua
Chairman, Committee on
Science and Technology
U. S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

It is a pleasure to comment on H. R. 7178, proposed legislation to provide additional information for the Congress' use as a basis for implementing multi-year research and development authorizations. I would like to limit my remarks to the impact of the proposed bill on the National Science Foundation.

As I indicated to you in my letter of October 18, 1979, the National Science Board considered biennial authorization for the National Science Foundation in 1977 and adopted a resolution encouraging the Foundation to seek a two-year authorization, with adequate provision for budget and program flexibility. On September 20, 1979, the Board discussed H. R. 4490, an earlier version of the current bill. The Board limited its consideration to biennial authorization for the Foundation and took the following position:

> The National Science Board supports the concept of a two-year authorization for National Science Foundation programs, containing adequate provisions for program flexibility, particularly in the second budget year.

During discussion, the potential stabilizing value of such authorization in planning for research was noted, as were potential difficulties likely to arise from inflation and from the unpredictability of new or changed program direction and emphasis.

In my judgment, H. R. 7178 is in keeping with the views of the Board insofar as its impact on the National Science Foundation is concerned.

With regard to the changes proposed in H. R. 7178 regarding reports that have become the responsibility of the NSF, there are no problems with the shift to a four-year reporting cycle even if for a five-year Outlook report. It is our understanding that the intervening two-year update of that report would be an update on a substantially smaller scale than the report itself, an idea with which we concur. We have no problem with repeal of the requirement for an annual Science and Technology Report, and we understand that this would not preclude submission of reports from time to time.

There are quite naturally many problems in trying to move the highly complicated budgetary procedures from one-year to a multi-year cycle. Nevertheless, an effort in this direction seems highly desirable. I commend you for your efforts in trying to move in this direction.

Sincerely,

Norman Hackerman
Chairman

216:26-27

APPENDIX A

RESOLUTION UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS TWENTY-FIFTH ANNUAL (173RD) MEETING
May 16, 1975

The National Science Board opposes H.R. 5796 and Section 7 of H.R. 4723, as passed, that would require proposed grants to be available for 30 days of Congressional review prior to final award.

The proposed legislation has the potential for producing serious weakening of science which has been made strong over the last 25 years by National Science Foundation (NSF) sponsorship of the highest quality and priority research projects. Review of scientific proposals with a goal that the best be selected requires utilization of highly qualified and technical experts able to understand the proposed experiments, the achievability of goals, and the competence of researchers to undertake the proposed investigations. The evaluation and selection process involves an examination of more than 24,000 proposals involving some 1,000,000 pages of technical material each year. The identification of the proposals to be supported has been performed effectively by a competitive system which includes peer review and involves several thousand distinguished experts in the country combined with the studied judgment of the NSF professional staff. Of the hundreds of thousands of grants awarded by the NSF over the years, only a small fraction has been questioned by Members of the Congress and others.

The National Science Board in its role as a policy-making body welcomes the continued oversight of Foundation programs by the Congress. On its part the National Science Board will continue to ensure that the management practices of the Foundation operate to identify and support the best and highest priority research in the country.

The National Science Board strongly urges the Congress to reject H.R. 5796 and Section 7 of H.R. 4723, as passed, in its further consideration of the Foundation's fiscal year 1976 authorization. It is our opinion that the two bills propose to extend Congressional control in too great a detail to be either effective or efficient.

173:24

TWO-YEAR AUTHORIZATION

Excerpt from the Approved Minutes of the NSB Meeting, April 25, 1977 (NSB-77-156)

Committee on Budget--Twenty-Fourth Meeting--March 17

Dean Meckling, Chairman, reported that the Committee discussed the markup by the Subcommittee on Science, Research, and Technology and the subsequent markup by the House Committee on Science and Technology of the NSF budget estimates for fiscal year 1978. The Committee also discussed the proposed budget recommendations for fiscal year 1979 and the possibility of a two-year authorization and agreed on a resolution for presentation to the Board, which was adopted as follows:

> The National Science Board unanimously ENCOURAGED the Foundation to seek a two-year authorization with adequate provision for program flexibility and special hearings on issues of special interest to the Congress

Dr. Sanderson, in responding to questions on the matter of flexibility, stated that the Foundation presently has reprogramming authority for up to 10 percent of the budget and, in addition, can reprogram beyond 10 percent if 30 days notice is given to the Congress.

188:20

NSF STAFFING

AFFILIATIONS OF PRESIDENTIALLY APPOINTED STAFF

The General Counsel reminded the Board of its statutory obligation to approve certain outside affiliations of the Director, Deputy Director, and Assistant Directors. He distributed a current list (NSB-73-224) for the Board's consideration with two additions: Dr. Creutz--Chairman, Program Submission Review Subpanel on Multi-Directional Research, Atomic Energy Commission; and Dr. Eggers--Chairman, Program Submission Review Subpanel on Solar Energy Research, Atomic Energy Commission.

> The National Science Board CONSIDERED and unanimously APPROVED the outside affiliations of the Director, the Deputy Director, and the Assistant Directors as reported to the Board by the Director in NSB-73-224, as amended above, pursuant to the requirements of Section 14(b) of the National Science Foundation Act of 1950, as amended.

To avoid undue delay in acting on future invitations to the staff to serve in external advisory capacities, the General Counsel proposed and the Board agreed to the following resolutions (as set forth in NSB-72-238--distributed at the meeting):

> The National Science Board unanimously DELEGATED to the Chairman of the Board its authority under Section 11(b) of the National Science Foundation of 1950, as amended, to approve the holding by the Director of any office in or action in any capacity for any other Federal agency with which the Foundation makes any grant, contract, or other arrangement;
>
> Further, the Board unanimously DELEGATED to the Director its authority under Section 14(b) of the Act to approve the holding by the Deputy Director or any Assistant Director of any office in, or action in any capacity for, any other Federal agency with which the Foundation makes any grant, contract or other arrangement under this Act;
>
> Further, the Board unanimously DELEGATED to the Executive Committee its authority under Section 14(b) of the Act to approve the holding by the Director, the Deputy Director, or any Assistant Director, of any office in, or action in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act, provided, however, that the Director as a member of the Executive Committee shall not vote upon any matter regarding himself; and
>
> Finally, the Board unanimously REQUESTED that all such approvals granted under the above resolutions shall be reported at the next meeting of the Board.

158:45.

EXCEPTED AUTHORITY

Section 14(a) of the NSF Act of 1950, as amended, provides that the Director may appoint technical and professional personnel and establish their compensation, in accordance with policies prescribed by the Board, without regard to the usual Civil Service Commission (CSC) competitive service rules and regulations. The Board in a number of previous instances has approved guidelines to the Director for use of this "excepted authority."

The Director and Mr. Taylor informed the Board of recent negotiations with CSC regarding the Foundation's administration of its excepted appointment authority (NSB-74-246--distributed at the meeting). The central issue of these negotiations was a CSC concern that NSF's use of the excepted authority did not adequately reflect appointment based on merit principles, particularly for the so-called backup or support positions required by staff offices.

The Executive Committee had reviewed this proposed revised policy which had been agreed to by CSC and recommended the Board's approval of it. After discussion, the Board acted as follows:

> The Board, in accordance with Section 14(a) of the National Science Foundation Act of 1950, as amended, unanimously PRESCRIBED the following policy to guide the Director in the appointment of personnel in accordance with the provisions of Title 5, United States Code, governing appointments in the competitive service, and the provisions of Chapter 51 and sub-Chapter III of Chapter 53 of such Title relating to classification and the General Schedule pay rates and the appointment of personnel without regard to such provisions when he deems such action to be necessary for the discharge of the responsibilities of the Foundation:

"Policy. Set forth below is NSF policy governing the use of Competitive and Excepted Appointment Authority:

(1) Appointments to positions in the NSF will normally be made in accordance with the provisions of Title 5, United States Code, and applicable CSC laws and regulations except as provided in (2) below.

(2) The Excepted Authority to appoint technical and professional personnel necessary for the discharge of the Foundation's responsibilities will be used only in the following circumstances:

(a) Appointments of personnel to top management positions. These positions include Assistant Directors, Deputy Assistant Directors, and persons holding equivalent positions. All such appointments shall be subject to the approval of the Director.

(b) Appointments to positions which clearly require specialized abilities based on scientific or engineering training and/or experience. All such appointments must be approved by the Director or Deputy Director.

(c) Appointments of professional staff to the National Science Board (limited by law to a total of five).

(d) Appointments in special circumstances with concurrence of the CSC."

A review will be made by NSF of all positions to determine whether existing excepted appointments are in conformance with the above policy. Excepted appointments which cannot be regularized to conform with this policy will continue as interim exceptions during the period of incumbent employment. All new appointments will be made in accordance with this policy.

Mr. Taylor will render a progress report to the Board next fall.

167:3-5

EXCEPTED AUTHORITY

The Committee also discussed excepted appointment authority and proposed a resolution which after a slight alteration was adopted by the Board as follows:

> In order to clarify and reaffirm National Science Board policy, the Board unanimously REVISED Section 2(b) of its resolution of October 18, 1974, regarding excepted appointment authority to read as follows: "Appointments to positions which require specialized scientific, engineering, legal, or managerial training and/or experience necessary for the discharge of the legislatively mandated responsibilities of the Foundation. All such appointments must be approved by the Director."

183:29

APPENDIX A

NATIONAL SCIENCE FOUNDATION POLICY GOVERNING THE USE OF COMPETITIVE AND EXCEPTED APPOINTMENT AUTHORITY

as Approved by the National Science Board at its 167th Meeting on October 17-18, 1974, as Amended at its 183rd Meeting on August 20, 1976, and 194th Meeting on November 17-18, 1977.

Set forth below is the National Science Foundation policy governing the use of Competitive and Excepted Appointment Authority:

1. Appointments to positions in the National Science Foundation will normally be made in accordance with the provisions of Title 5, United States Code, and applicable Civil Service Commission (CSC) laws and regulations except as provided in 2 below.

2. The Excepted Authority to appoint technical and professional personnel necessary for the discharge of the Foundation's responsibilities will be used only in the following circumstances:

    a. Appointments of personnel to top management positions. These positions include Assistant Directors, Deputy Assistant Directors, and persons holding equivalent positions. All such appointments shall be subject to the approval of the Director.

    b. Appointments to positions which require specialized scientific, engineering, legal, or managerial training and/or experience necessary for the discharge of the legislatively mandated responsibilities of the Foundation.

    c. Appointment of professional staff to the National Science Board (limited by law to a total of five).

    d. Appointments in special circumstances with the concurrence of the CSC.

3. All appointments listed in section 2 b through d above must be approved by either the Director or the Deputy Director.

194:31

APPENDIX B
NSB/Res-78-85/B

ROTATOR POLICY

Resolution Adopted by the National Science
Board at its 200th Meeting August 17-18, 1978

Whereas, the National Science Foundation has, for many years, augmented the permanent staff of professional and technical employees with highly skilled employees on leave of absence from universities, colleges, laboratories, and other related agencies, institutions, and organizations; and

Whereas the National Science Foundation and the parent organization of the participant derive mutual benefit from the rotational assignment of such individuals; and

Whereas, the infusion of rotator personnel through appropriate assignments strenthens the relationships between the National Science Foundation and the organizations and activities with which it conducts its business; and

Whereas, the National Science Foundation rotator program provides the National Science Foundation with professional or technical personnel who are current in academic, research, scientific, engineering, legal, or managerial matters; and provides the individuals with experience and participation in a national program of Federal assistance;

Therefore, be it RESOLVED, That: the National Science Board reaffirmed its support of the use of rotator personnel on leave of absence from their parent organization, agency, or institution, to perform duties necessary for the discharge of the responsibilities of the National Science Foundation.

The number of rotator personnel employed by the National Science Foundation should not be restricted, but should be in numbers great enough to assist in the accomplishment of the National Science Foundation mission and objectives. The number and types of rotator personnel should provide for representation of appropriate disciplines, skills, and knowledges to insure that the National Science Foundation base of expertise receives continual replenishment from the academic, research, professional, and technical communities.

August 17, 1978

200:23

MINORITIES AND WOMEN

NSB-75-163

RESOLUTION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 172ND MEETING ON APRIL 21, 1975

Whereas, the year 1975 was proclaimed as International Women's Year by the General Assembly of the United Nations on December 18, 1972;

And whereas, the President of the United States has by Proclamation on January 30, 1974, and Executive Order on January 9, 1975, given full support of International Women's Year and established a National Commission on the observance thereof;

Therefore, be it RESOLVED, That:

The National Science Board RECORDS its full and unqualified support of this effort.

In particular, the Board ENDORSES the following objectives, set forth in the United Nations resolution, as having especial relevance to the scientific and technical community:

- To promote equality between men and women.
- To ensure the full integration of women in the total development effort, especially by emphasizing women's responsibility and important role in economic, social, and cultural development at the national, regional, and international levels. . . .

Further, the National Science Board URGES the participation of the educational and scientific communities in renewed efforts to increase and improve the roles of women within these communities. Specifically, the Board INVITES assistance in the encouragement of women to pursue careers in science and technology and in the elimination of inequities that still linger as barriers to their full participation in these careers.

Through this resolution the Board PLEDGES its continuing efforts and those of the National Science Foundation (NSF) toward the following specific goals:

- To assure the fair competition of women for NSF grants and contracts;
- To increase the number of women on NSF advisory panels and committees;
- To enhance public awareness of the current and changing roles of women in science and technology;
- To improve understanding of motivational factors which encourage the selection by women of science careers;
- To encourage, through direct example, equal hiring and promotion of qualified women at all levels of employment.

EXCERPT FROM MINUTES OF THE TWENTY-SIXTH ANNUAL (181ST) MEETING OF THE NATIONAL SCIENCE BOARD--MAY 20-21, 1976

Committee on Minorities and Women in Science

Fifth and Sixth Meetings--April 15 and May 19--Dr. Nierenberg, in the absence of Dr. Cobb, Chairperson, informed the Board that the Committee discussed future plans for minorities and women in science and formulated a resolution which he presented to the Board and which was acted upon as follows:

> The Board AUTHORIZED the Directorate for Science Education to develop programs and alternative approaches designed to meet the following objectives and to present them to the Board along with budget estimates for the support of these programs at appropriate levels:

(a) Post-baccalaureate training--to develop and support a graduate education program in science that is directed to increasing substantially the participation of students from disadvantaged backgrounds through research and training beyond the baccalaureate degree in Ph.D.-granting-institutions.

(b) Undergraduate assistance--to develop programs designed to assist in the undergraduate preparation of talented individuals who, due to socioeconomic factors, are financially or otherwise disadvantaged. This effort is essential for correcting the current underrepresentation of this group in the science and technology work force.

(c) Precollegiate assistance--to develop programs at the precollegiate level that are designed to attract and retain disadvantaged students into scientific careers.

Mr. Meckling abstained from voting on the above resolution.

COMMITTEE ON MINORITIES AND WOMEN IN SCIENCE--
ELEVENTH MEETING--APRIL 21

Dr. Cobb, Chairman, presented a resolution (NSB-77-195--distributed at the Board meeting) which the Board approved as follows:

> Being the sense of the National Science Board that the programs instituted by the Director of the National Science Foundation to increase participation by minorities and women in the functions of the National Science Foundation should be supported and continued, the Board unanimously strongly APPROVED of these activities and REQUESTED the Director to continue to examine and improve the National Science Foundation's practices regarding the hiring, promotion, and participation of minorities and women in the functions, including the management of the Foundation, and to report regularly on these matters to the National Science Board.

MANPOWER

The proposed alternative has been reviewed extensively within the Foundation and by the Ad Hoc Committee on Manpower and the Economy. It satisfies the minimum science and engineering manpower information requirements. As stipulated by OMB, the anticipated operating costs of the system are considerably smaller than equivalent costs for the National Register. The system is more representative of the total science and engineering community than the Register.

> The Board unanimously APPROVED the development and implementation of an alternative system to the National Register of Scientific and Technical Personnel involving a doctorate roster, augmentation of the post-censal survey, and surveys of new nondoctorate entrants into the labor force, as set forth in NSB-71-279.

142: 8-9.

NATIONAL REGISTER OF SCIENTIFIC AND TECHNICAL PERSONNEL

The staff, having completed its study, recommended that (a) the emergency locator aspects of the Register be abandoned, and (b) the Register be operated on a 25 percent sampling basis with more intensive follow-up of respondents. About five percent of the sample would be changed at each successive registration with maintenance of a base sample of five percent to permit long-range longitudinal studies.

The Board unanimously **APPROVED** the proposed changes in the operation of the National Register of Scientific and Technical Personnel.

132:20

NATIONAL REGISTER ALTERNATIVES

AGENDA ITEM 6: NATIONAL REGISTER ALTERNATIVES

Dr. Falk stated that the President's Budget for fiscal year 1972 recommended the discontinuance of the National Register of Scientific and Technical Personnel and the development of alternative mechanisms for obtaining required information on scientists and engineers. He presented for Board approval recommendations regarding an alternative system to the National Register, as contained in a draft report (NSB-71-279--Members' Books, Tab I). A preliminary version of this report has been transmitted upon request to OMB. Before the end of the year the Foundation must submit a final version of the report to the House Committee on Science and Astronautics.

The proposed alternatives consist of three separate mechanisms: a comprehensive doctorate roster, based on the existing efforts of the National Research Council; continuous, periodic augmentation of the 1972 postcensal survey, which is already in its final stages; and surveys of new nondoctorate entrants in science and engineering, based on surveys of the American Council on Education. This combination of collections permits detailed, periodic coverage of doctorates, as well as relatively adequate coverage of the total science and engineering population and the critical new entrants. Implementation of this recommendation requires continuous support of certain minimum activities, i.e., continued maintenance of the doctorate roster; selection and regular surveys of a sample from the basic 1970 Census large enough to provide data with a given reliability; and periodic follow-up surveys of new entrants.

Since the proposed approach is based on existing systems, development of the new mechanisms can take place in fiscal years 1972-1973. Actual collections will also commence in this period. Estimated costs for development and operation will total $450,000 in fiscal year 1972 and $575,000 in fiscal year 1973.

SCIENCE AND SOCIETY/PUBLIC INTERACTION

PUBLIC PARTICIPATION IN NSF PLANNING, POLICIES AND PROGRAMS

Dr. Snow summarized NSB-75-352 (distributed at the meeting). He reminded the Board of the congressional mandate to submit a "public participation plan" on or about December 9 and of the Board's brief discussion of the plan at the October meeting. The staff has continued its consideration of this matter and has prepared a draft response which contains background information on: (1) present procedures; (2) plans for restructuring advisory committees; (3) proposed initiation of a small study contract to focus on the ways in which nonscience groups participate in NSF planning (with a view to strengthening this interaction, if possible); and (4) an experimental undertaking to acquire advice and opinion via large regional forums under NSB auspices held in various parts of the country with emphasis placed upon attendance by nonscience groups and elements of the scientific community not extensively involved with NSF planning.

Board reaction was elicited to the NSB regional forum proposal.

The Board discussed its present activities involving contact with the scientific and academic public, e.g., peer review survey, eighth Board report letters, Science for Citizens forums. It was proposed that the NSB regional forums be focused on a topic important in the Board's policy-making, specifically that the Board reports would provide an excellent platform. Following further discussion, the Board acted as follows:

> The Board ENDORSED the intent of the commitment of the National Science Board to the proposed NSB regional forums and AUTHORIZED the Executive Committee to monitor the development of plans for the forums.

ES:177:13-14

NSB REGIONAL FORUMS-- PUBLIC PARTICIPATION

Dr. Sanderson presented the staff's proposal for implementation of the Foundation's commitment to a series of NSB regional forums, with one to be held prior to June 30, 1976. The aim of such forums would be to: (1) increase scientific, professional, and citizen input to NSF program planning; (2) expand the information base to assist the Board in exercising its policy-making role. It was proposed that six such forums be held over the next two years, possibly in cities where Federal Regional Offices are located. The Office of Government and Public Programs would be responsible, directly or through a contractor, for the overall management of these events including the planning and organization of the meetings. The planning and conduct of the meetings as well as the evaluation of results of the series of forums was estimated to be about $450,000.

There was some discussion of the subject matter to be covered, the audience to be served, and the general purposes of the forums. The Board then acted as follows:

> The Board unanimously CONCLUDED that the first forum should be held before July 1, 1976, on an experimental basis and that it should be held at a site to be selected based on staff review, not in Washington, D.C.

180:34

INTERACTION WITH THE PUBLIC

Final Reports of Task Forces

Task Force 77-C

The Task Force submitted a report (final copy attached as Appendix D) to the Board containing two recommendations: (1) the appointment of "nonscience or public" Board Members with specific criteria to be followed in submitting such nominations for appointment; and (2) the establishment of a Board committee to serve as a focal point for considering the interactions between science and society. The Task Force also recommended priority agenda items for the new committee. These items concern the Foundation's public information operation, current Foundation interactions with the nonscience public, and the perceptions/needs of existing and potential constituencies of NSF. The recommendations are focused on broad policy issues. (Consideration of how these recommendations might be implemented was not discussed.)

There was considerable discussion of the intent and result of the first recommendation regarding Board membership. Some Members felt that it would be highly desirable for the Board to take the initiative in seeking out and recommending the appointment of public Members. Others felt such action should be left to external bodies and that the Board should concern itself with maintaining the highest possible scientific level for the Board. Still others considered that the proposed action further restricted the appointment of persons, since Section 4 of the NSF Act states that:

> (c) The persons nominated for appointment as members of the Board (1) shall be eminent in the fields of the basic, medical, or social sciences, engineering, agriculture, education, research management or public affairs; (2) shall be selected solely on the basis of established records of distinguished service, and (3) shall be so selected as to provide representation of the views of scientific leaders in all areas of the Nation.

At the conclusion of the discussion, the Board Chairman called for separate votes on the two recommendations of the Task Force.

> With a minor change, the Board ADOPTED the first recommendation of the report of Task Force 77-C that:
>
> "1. The National Science Board welcome the appointment of 'nonscience or public' Members to the Board based on the following criteria: the nominees should be persons eminent and knowledgeable in public affairs, who have not been practicing scientists, but who have demonstrated involvement or interest in science and technology."

Dr. Mac Lane voted against the above resolution.

With respect to the the second recommendation, Dr. Hubbard reminded the Board that one of the charges to the Committee on Mechanisms for Improved Policy Formulation and External Communications, of which he is the Chairman, is to formulate mechanisms which will allow the Board to undertake a more active external role in science policy formulation and to strengthen the Board's external linkages. The Committee has deferred the consideration in this item since it felt other charges should be given priority.

Following further discussion, the Board acted as follows:

> The Board ADOPTED the second recommendation of the report of Task Force 77-C that:
>
> "2. The National Science Board establish a Board committee on science and society to monitor and make recommendations with respect to Foundation programs and activities, existing and proposed, as they relate to the interface between science and society. Pursuant to this recommendation, the following three items are considered primary:
>
> "a. A review of the Foundation's public information mechanisms and processes oriented to the general public regarding developments in science.
>
> "b. A consideration of whether the Foundation has available to it a systematic, regularized means of determining the perceptions and needs of existing and potential constituencies, and to make appropriate recommendations.
>
> "c. A cataloging, description, and assessment of the involvement of nonscience publics in NSF's programs and activities, both formal and informal."
>
> 191:18-20

SCIENCE AND SOCIETY

Report of Task Force 77-C

Historically, the primary constituency of the National Science Foundation has been, and continues to be, academic and other scientists and engineers, because these are the principal performers of research and science education. However, the Foundation has had a variety of interactions with other constituencies, and the Task Force recognizes the need for even broader involvement with society and its various publics. Therefore, the Task Force recommends that:

1. The National Science Board welcome the appointment of "nonscience or public" Members to the Board based on the following criteria: the nominees should be persons eminent and knowledgeable in public affairs, who have not been practicing scientists, but who have demonstrated involvement or interest in science and technology.

2. The National Science Board establish a Board committee on science and society to monitor and make recommendations with respect to Foundation programs and activities, existing and proposed, as they relate to the interface between science and society. Pursuant to this recommendation, the following three items are considered primary:

   a. A review of the Foundation's public information mechanisms and processes oriented to the general public regarding developments in science.

   b. A consideration of whether the Foundation has available to it a systematic, regularized means of determining the perceptions and needs of existing and potential constituencies, and to make appropriate recommendations.

   c. A cataloging, description, and assessment of the involvement of nonscience publics in NSF's programs and activities, both formal and informal.

June 24, 1977

191:27

REGIONAL FORUMS

Planning and Policy Committee--Forty-Ninth Meeting
January 19, 1978

Dr. Reynolds, Chairman, Committee on Planning and Policy, stated that the Committee had discussed with the staff draft documents and preparations for the Board long-range planning meeting in June. The Committee decided to accept the invitation of its Chairman to meet at Louisiana State University on February 24 to develop the discussion issues for June.

With respect to the NSB forums, the Committee adopted the following resolution:

NSB/Res-78-7 RESOLVED, that the National Science Board, in building upon the experience of the NSB Regional Forums, should continue to sponsor at least one forum annually in secure policy and/or programmatic input from the broader public; such a forum activity should include various and appropriate pre-forum planning meetings and activities.

195:20

REGIONAL FORUM ACTIVITIES

Dr. Hubbard requested Dr. Cota-Robles to inform the Board of the proposed statement on NSB Regional Forums (PPC/SS-80-22--distributed at the meeting) submitted by the PPC Subcommittee on Science and Society and endorsed by the PPC. Dr. Cota-Robles stated that the Subcommittee believed that, although the regional forums were valuable and useful, it did not recommend that they be continued as a major vehicle in the future. Instead, the Subcommittee recommended experimentation with other means to guage opinions and to share concerns over the directions of NSF programs, policies, and priorities. Continuation of the experimental mode will allow for comparisons of the various means at a later date. On the PPC Chairman's recommendation that the Board accept this proposed statement on NSB Regional Forums, the Board took the following action:

NSB/Res-80-2	The Board unanimously ADOPTED the proposed National Science Board Statement on the Regional Forum Activity (PPC/SS-80-2) attached to these minutes as Appendix B.

APPENDIX B

NSB-80-71

STATEMENT ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 212TH MEETING ON JANUARY 17-18, 1980

REGIONAL FORUM ACTIVITIES

The National Science Board (NSB) conducted a series of six regional forums in response to language in the fiscal year 1976 authorization act (Public Law 94-86). The language in that act directed the Foundation to:

> . . .facilitate the participation of members of the public in the formulation, development, and conduct of the National Science Foundation's programs, policies, and priorities. . .

The effort culminated with a final staff report on the forums that has been provided to each forum participant, as well as to several governmental organizations including the Federal Coordinating Council on Science, Engineering, and Technology and the Office of Technology Assessment.

Several observations can be made. First, the forum mechanism allowed the NSB to hear the views and ideas of an extremely involved and articulate segment of the public.[1] Further, when focused upon specific issues or policies facing the NSB, the Board found general support for several current National Science Foundation (NSF) policy and programmatic directions.

In spite of these positive observations, several questions remain. The National Science Board continues to ask the question "Who are the members of the public that the Board should be hearing?" as well as "Which segment of the public has the Board reached and is it that segment that should be reached?" The National Opinion Research Center (NORC) provides some assurances, e.g., that, while it is difficult to reach "the public," the forums did reach an informed and attentive portion of the American public. Although this public was reached effectively, questions remained about the amount of information needed by participants to participate fully. Was the information provided the appropriate type of information, and was it enough information to allow participants to make their most useful contribution in this participatory process? Concerns are not diminished when there are discussions among distinguished scientists--here and abroad--over what is basic, fundamental research that adds to the stockpile of human knowledge, and the relationship of that knowledge to the solutions to particular problems. The Board is forced to conclude that the meshing of broader, public concerns and efforts at problem-solving with basic, fundamental scientific research--while possible--is at best a very difficult task.

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[1] The National Opinion Research Center, under contract to NSF to survey the participants and analyze their responses, described the NSB forum attendees as members of "an attentive stratum of American society." The NORC report is included in the final staff report (NSB-79-22).

This leads to the conclusion that, while the National Science Board did receive valuable and sincere ideas as input from an attentive segment of the public, the Board should continue to experiment with other means to gauge opinions and to share concerns over the directions of the NSF's programs, policies, and priorities. Continuation of the experimental mode will allow for comparisons of the various means at a later date.

The National Science Board gratefully acknowledges the sincerity and interest of all who participated in this necessary but experimental effort to secure public involvement in science policy formulation.

January 17, 1980

212:33

APPENDIX C

NSB-80-72

POLICY STATEMENT ADOPTED BY THE NATIONAL SCIENCE BOARD
AT ITS 212TH MEETING ON JANUARY 17-18, 1980

ON PUBLIC ATTENDANCE AND PARTICIPATION AT BOARD AND BOARD COMMITTEE MEETINGS

It is the policy of the National Science Board (NSB) to give the public open access to the decisionmaking of the Board to the fullest extent that is practicable, consistent with the rights of individuals, and consistent with the ability of the Board generally to carry out its responsibilities. It is the general rule of the Board that every meeting of the National Science Board will be open to public observation. Certain exceptions to this rule are made to protect the rights of citizens and the functioning of the Board and the Foundation. The Government in the Sunshine (GIS) regulations of the National Science Board (45CFR §614) identify the conditions under which meetings may be closed.

All provisions of the NSB GIS regulations applicable to the Board apply equally to the Executive Committee of the Board whenever the Executive Committee is meeting pursuant to its authority to act on behalf of the Board (§614.8).

It is the policy of the National Science Board that meetings of the Executive Committee when not meeting pursuant to its authority to act on behalf of the Board, and all other NSB committees, shall not be open to public observation in order to preserve the deliberative processes and to permit the members of the committees to express frank, uninhibited, and perhaps personal opinions in a setting where no final decisions or ultimate responsibilities lie. Such final decisions are the responsibility of the Board.

Board committee chairmen may, on occasion, after consultation with the Board Chairman, invite experts to meet with Board committees to discuss items of special interest to the committees.

These policies concerning public observation of Board and committee meetings are in compliance with the Government in the Sunshine Act.

January 17, 1980

212:34

INFORMATION TRANSFER POLICY

ROLE OF PROFESSIONAL SOCIETIES, COMMERCIAL ORGANIZATIONS, UNIVERSITIES, AND GOVERNMENT AGENCIES IN THE INFORMATION TRANSFER PROCESS

Dr. Owen also presented for Board review and approval a statement of Foundation policy for science information as outlined in NSB-71-263 (Members' Books, Tab H). This paper, accepted by the Executive Council, enunciates and clarifies existing relationships between the Foundation and the several kinds of activities concerned with science information. The recommended policies reflect the approach being taken by the Office of Science Information Service and are acceptable to representatives of the private-sector groups which it affects.

The recommended policies follow:

a. The Foundation will continue to encourage the development of information resources essential to the national need for scientific and technical information as appropriate through professional societies, nonprofit institutions, commercial organizations, and universities.

b. The Foundation will provide temporary assistance only to those primary publication activities which are judged to be essential to the scientific community, which will not be undertaken by commercial enterprises without Foundation subvention, and which are capable of reaching a self-supporting status within a short period of time.

c. The Foundation will continue to endorse the efforts of professional societies and related nonprofit organizations as the primary instrumentalities for secondary processing, and will encourage them to utilize the capabilities of commercial organizations in developing new and improved techniques and systems for such processing.

d. The Foundation recognizes that commercial organizations are primary instrumentalities for the development and marketing of products and services deriving from the machine-readable output of secondary processing carried out by nonprofit activities.

e. The Foundation will continue to support the development of information resources and services at universities for the academic community, but will encourage universities to utilize commercial user services where these are available.

f. In recognition of the role of each of the organizations involved in the information-transfer process, the Foundation will require that all machine-readable products and services created by any of these organizations with Foundation support be made available to the others on an equitable basis at a reasonable price related to the cost of production.

Dr. Hackerman reported that the Programs Committee after careful review recommended approval of the proposed policy.

The Board unanimously APPROVED the policies recommended in NSB-71-263 as a statement of Foundation policy.

142: 7-8.

OCEANOGRAPHY PROGRAMS

APPENDIX C
NSB-78-338

NSB/Res-78-93/B

STATEMENT ON FUTURE SCIENTIFIC DEEP SEA DRILLING PROGRAM AS UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 200TH MEETING ON AUGUST 17-18, 1978

The idea of deeper penetration of selected parts of the ocean floor by geophysical and geological methods during the 1980's is a logical extension of the Deep Sea Drilling Project (DSDP) and the International Program of Ocean Drilling (IPOD). This concept embodies not only the principle of furthering the understanding of the physical and chemical processes consequent to the theory of plate tectonics but also has a direct bearing on the origin of ore deposits and the possible occurrence of deeper hydrocarbons and the techniques for their discovery and extraction. Moreover, the National Science Foundation is the logical lead agency for this endeavor.

Because the scope of this activity involves the development of new technological capabilities in ocean drilling techniques, and the scale of funding is on the order of three-fourths of a billion dollars over a ten-year period, the National Science Board believes that the success of the venture will require careful planning to develop specific goals and a timetable for their attainment. The Board believes that this process requires the involvement of a wide spectrum of scientists and engineers representative of the disciplines involved, including those from other participating Federal agencies and the international scientific and technological community, and that the time required to develop an initial evaluation of the feasibility of attaining the goals embodied in the concept may require one to two years. For these reasons, the National Science Board believes that a prudent approach would be to expend greater effort in resolving the many scientific, technological, and organizational issues than would be possible if the program were to begin in fiscal year 1980. Although this would delay the initiation of the program for a minimum of one year, it greatly increases the probability that a more carefully planned and potentially successful program will result.

Not inconsequential to the Board's position is the fact that the budgetary implications of this program have not been totally resolved and reflected in the National Science Foundation's long-range planning. To endorse this program without a clear understanding of the fiscal impact on the Foundation's budget over the next decade would be inappropriate at this time.

Therefore, the National Science Board:

1. Agrees that the extension of the scientific knowledge of the lithosphere with special reference to selected parts of the oceanic crust and continental margins as proposed in the reports of the Ad Hoc Advisory Group for Future Scientific Ocean Drilling (FUSOD-May 2, 1978) and the Ocean Sciences Board of the National Research Council 1/, is a meritorious one;

2. Believes that there is a reasonable possibility that a program of this scale and scope could add significantly to the knowledge of the origin of mineral resources associated with oceanic and crustal processes;

3. Recommends, therefore, that to assure an orderly process in the planning, funding, and execution of this program, another year or more, if needed, of planning and discussions should be allowed, which process should involve the widest possible spectrum of scientists, engineers, and others who can contribute to the scientific, technological, fiscal, and managerial aspects of the program;

4. Agrees to consider funding this planning effort and will be receptive to presentations from the planning group from time to time in order to be kept abreast of the direction in which the group is headed; and

5. Finally, believes that an extension of the work of the GLOMAR CHALLENGER for a two-year period is a reasonable proposition in anticipation of a possible future second phase of ocean drilling and geophysical exploration, but that the funding of this work should not be interpreted by the scientific community as a precursor of the endorsement, approval, or funding of the second phase.

CS:200:16-17

1/ Continental Margins: Geological and Geophysical Research Needs and Problems--in press.

APPENDIX C
(Attached to
NSB-79-326)

NSB-79-328

STATEMENT ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 208TH MEETING ON AUGUST 16-17, 1979

Ocean Margin Drilling: A Program for the 1980s

A program of ocean margin drilling during the 1980's is a logical extension of the highly successful Deep Sea Drilling Project (DSDP), now in the International Phase of Ocean Drilling (IPOD). The program is an attractive convergence of scientific goals, resource exploration, and technological development.

The first detailed presentation of the new program was in a document, published in July 1977, entitled "The Future of Scientific Ocean Drilling" (FUSOD). Since then considerably more planning has culminated in the proposed Ocean Margin Drilling (OMD) Program. The objectives of FUSOD/OMD focus on an increased understanding of the physical and chemical processes that shape the earth. The investigations have a direct bearing on the origin of ore deposits and the possible occurence of hydrocarbons in the deeper waters. Although some additional drilling is planned in the deep oceans, the OMD Program will pay particular attention to the ocean margins as the last major unexplored unit of the earth's crust. The margins are critical to understanding the accretion and evolution of the continents and ocean basins. The resource potential of the outer continental margin is also largely unknown for oil and gas and other minerals.

The proposed OMD Program is both difficult and expensive. It will involve the development and application of new technological capabilities. It will cost more than half a billion dollars during the proposed ten-year life of the program. Thus, when the plans were first presented to the National Science Board in 1977, the Board requested the National Science Foundation (NSF) to undertake an in-depth study and review by a broadly experienced group of scientists and engineers from the earth and ocean sciences, including representatives from other participating Federal agencies, industry, and the international community.

The consequent studies were completed and reviewed by the Committee on Post-IPOD Science, more familiarly called the "Blue Ribbon Panel." This Committee, chaired by Dr. H. Guyford Stever, included nationally known scientists, engineers, and other public figures. They reviewed all the previous studies and evaluated the proposed program in terms of scientific importance, potential practical applications, technical feasibility, and national priority. The Committee concluded that the proposed OMD Program ". . . is very important to both science and resource exploration, and that it should be given high priority consideration for approval in the NSF budget for FY 1981." The Committee noted also that ". . . the combined science and resource exploration justify the cost." The Committee report, "The Merits and Potential of a Proposed Ocean Drilling Program For the 1980's," was submitted to the Director of NSF on July 11, 1979.

The National Science Board, especially through its Programs Committee and more recently through its Ad Hoc Committee on Deep Sea and Ocean Margin Drilling Programs, has maintained a knowledge of the various studies. The National Science Board believes that significant progress has been made in evaluating and planning for the proposed program and that it can be of great and substantive scientific importance. In addition, the OMD Program will aid in the development and application of deep water technology and will be an important step in the early evaluation of continental margins as a source of hydrocarbons and other mineral accumulations. If the successes of the present DSDP are used as a model, the OMD Program offers new opportunities for extensive and profitable collaboration between NSF, other Federal agencies, industry, and foreign countries.

The National Science Board recognizes and reiterates the high potential of the Ocean Margin Drilling Program and strongly supports its implementation.

The National Science Board notes that, although the Administration intends to assign NSF the lead agency and management responsibilities for the Ocean Margin Drilling Program, it is anticipated that the funding will be derived from multiple sources. Those sources, which are now being explored, include other Federal agencies, industry, and foreign countries. The Board endorses continued development of the OMD Program with the assumption that NSF budgeted funds devoted to ocean drilling will approximate their present level. The NSB recommends that any additional Federal funds needed to support OMD should be provided as an add-on to the Foundation's budget.

It is recommended also that support for the Ocean Margin Drilling Program be endorsed as a separate line item in the budget of the National Science Foundation.

208:22-23

OCEAN MARGIN DRILLING PROGRAMS

h. Ad Hoc Committee on Deep Sea and Ocean Margin Drilling Programs--Eighth Meeting--November 15

Dr. Bisplinghoff, Chairman, reported that since the last Board meeting there has been a great deal of activity regarding the proposed OMD Program. He stated that the OMD Program, as it was envisioned earlier, called for the early conversion of the GLOMAR EXPLORER, and its use for drilling beginning in 1983 with a shift to a riser system when it becomes available in 1984. This plan involved a high start-up cost, approximately $48 million in fiscal year 1981, which was difficult for both Government and industry to fund. Because of these funding problems, during the past month the OMD Program has been modified to stretch out the activity so as to require about $20 million in 1981. This revised program involves little or no riserless drilling for GLOMAR EXPLORER, and a hiatus in drilling from 1982 (when GLOMAR CHALLENGER operations cease) until 1984 (when GLOMAR EXPLORER operations commence). The new plan assumes that a total of $20 million will be budgeted for OMD in fiscal year 1981, $10 million provided by NSF and $10 million to be contributed by the petroleum industry. The NSF would include $10 million in its 1981 budget request under a new line item of Ocean Margin Drilling.

As a result of this more modest entry into OMD, i.e., $20 million instead of $48 million, there will be a stretching out of the program as well as some omissions. Perhaps the most important omission will be the dropping of riserless drilling, creating a longer hiatus in drilling. This revised program may have lesser support in the scientific community because of this longer hiatus. The revised program will be discussed later this month by the Executive Committee of JOIDES. Dr. Bisplinghoff stated that he had been informed that Dr. Press will also discuss the program with representatives from the various interested NSF advisory groups and the academic community to assess the revised planned research effort. [1]

Dr. Bisplinghoff noted he and Dr. Hackerman had attended a meeting convened by Dr. Press with representatives of the petroleum industry and Government on November 7 from which there was a mixed assessment of industry's future role. However, Dr. Bisplinghoff stated that he was personally optimistic that industry will join in the program. Their representatives are now considering this matter and expect to reach a decision on their participation and funding by December 15.

Dr. Bisplinghoff stated that during the next month there will be fast moving events with decisions that will either terminate the program or allow it to proceed. There appear to be three possibilities: (1) industry would join the activity and the OMB will agree to an add-on for NSF, which would be consistent with the Board's previous understanding of and concurrence with the OMD Program; (2) industry would decide not to participate at all or at least express a lack of enthusiasm, which would result in industry raising less than its share, providing for either a greatly modified program or terminating planning for it, a decision which would have to be made by Dr. Atkinson and Dr. Press; or (3) industry would agree to contribute $10 million, OMB would endorse the program, assign NSF the lead agency responsibility, and direct NSF to take the $10 million out of the 1981 budget request without additional funding. He noted the third possibility presents the most difficult decision to NSF.

Dr. Bisplinghoff stated finally that the Ad Hoc Committee on Deep Sea and Ocean Margin Drilling Programs recognizes the extreme difficulty of the funding problem for NSF, but that the Committee continues to believe in the importance and the potential value of the OMD Program. The Ad Hoc Committee recommends that every avenue be pursued by the Administration to undertake this timely program, for the following reasons: (1) the OMD Program is the logical continuation of the drilling performed by GLOMAR CHALLENGER under NSF direction and funding, and it represents the next step in the exploration of the earth's crust, of which 71 percent lies beneath the surface of the sea; (2) the OMD Program offers an excellent opportunity for closer collaboration between Government and industry on a cost-sharing basis without infringing on the basic principles of the free enterprise system; and (3) the OMD Program is in the national interest, given the deteriorating reserves and the consequent price escalation of the world's supply of hydrocarbons, especially crude oil, and given the fact that oil and gas will be in increasing demand in the United States and elsewhere for the next 25 to 50 years.

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[1] This meeting was subsequently scheduled for December 10.

Following Dr. Bisplinghoff's report a lengthy discussion ensued regarding the possible funding mechanisms for the proposed OMD Program, the science expected therefrom, and the nature of the activity as is presently contemplated under the revised plan. The possible infringement on other NSF programs with limited resources, including the so-called core support research programs, was discussed. The nature and value of the scientific understanding to be gained from OMD, as compared to other research requiring funding, was also considered at length.

It was noted that the full Board does not plan to meet again until January 1980 and that major decisions regarding the proposed OMD Program might have to be made in December. The Chairman called the Board's attention to its general delegation of authority to the Executive Committee to ". . . approve grants . . . and . . . act for the Board between meetings of the Board on other matters in those rare instances where immediate decision is required between Board meetings, and where the necessary action is not encompassed within the authority of the Director." He also recalled the Board's action endorsing the proposed OMD Program at its August 1979 meeting (NSB-79-328). After further discussion the Board then decided to delegate specific authority to the the Executive Committee to act on its behalf during the next two months:

NSB/Res-79-108 The Board AUTHORIZED the Executive Committee to provide advice to the Director on the proposed Ocean Margin Drilling Program as events develop between the November and the next Board meeting.

The Board concluded the lengthy discussion on the proposed OMD Program by taking the following action:

NSB/Res-79-109/A The Board ADOPTED the statement attached as Appendix C as the sense of its discussion on the proposed Ocean Margin Drilling Program.

APPENDIX C
NSB/Res-79-109/B
(Attached to
NSB-79-466)

NSB-79-451

STATEMENT ADOPTED AS THE SENSE OF THE BOARD AT
ITS 211TH MEETING ON NOVEMBER 15-16, 1979

Ocean Margin Drilling

The National Science Board has several times considered a Program of Ocean Margin Drilling (OMD) which would be a logical successor to the highly successful Deep Sea Drilling Project. Such a Program would have important scientific goals and would provide new scientific knowledge which may permit later assessment of the resources of the continental margins.

At its 208th Meeting in August 1979 the National Science Board passed a resolution (NSB-79-328) endorsing the objectives of the proposed OMD Program and strongly supporting its implementation. At the same time it noted that such a large effort could not be undertaken within existing science budgets without seriously distorting other important scientific efforts. It therefore recommended that funds in the National Science Foundation budget allocated to ocean drilling continue to approximate their present level and that additional funds be sought from Federal and other sources to support the additional costs of the proposed OMD Program.

Since August intensive efforts to seek such support have continued, and a decision as to whether an OMD Program will be included in the President's Budget for Fiscal Year 1981 is expected soon. The National Science Board reviewed these efforts at its 211th Meeting in November 1979 and reiterated its stand on the Ocean Margin Drilling Program as expressed in the resolution (NSB-79-328) adopted in August 1979.

November 16, 1979

Attachment:
NSB-79-328

211:21

PROGRAMS--INSTRUMENTATION NSB-78-51

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 195th MEETING ON JANUARY 19-20, 1978 ON THE REGIONAL INSTRUMENTATION FACILITIES PROGRAM

The National Science Board unanimously APPROVED the Regional Instrumentation Facilities Program and the general guidelines for its management as submitted to the Board in NSB-78-10 and AUTHORIZED the initiation of the Program in an amount not to exceed $3,200,000 in fiscal year 1978 and the issuance by the Director of a Project Announcement as set forth in NSB-78-10.

January 31, 1978

INTERNATIONAL PROGRAMS

TASK FORCE 76-B

Dr. Hahn, Chairman, presented the draft report of Task Force 76-B on international science (copies distributed at the meeting). It was noted that this document for the most part records and endorses the present activities of the Foundation.

Following a brief discussion and clarification of the intent of the Task Force's recommendations,

> The Board unanimously APPROVED the draft report of Task Force 76-B.

A final copy of the report is attached as Appendix B.

182:14

APPENDIX B

REPORT OF TASK FORCE 76-B ON INTERNATIONAL SCIENCE AS APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 182ND MEETING JUNE 18, 1976

Issue 76-B

Task Force 76-B addressed the question: How can science/NSB/NSF play a greater role in serving the foreign policy interests of the United States, while maintaining domestic obligations and the National Science Foundation's commitment to scientific quality?

Summary of Actions and Recommendations of Task Force 76-B

In order to focus more sharply on the issue, it was agreed that science and technology activities having an impact on international relationships could be placed into the following two categories:

> Category I--Science initiated by U.S. scientists solely in terms of the scientific interest and significance of the work, with no other factors involved in initiation.
>
> Category II--Scientific and technological activities initiated by U.S. foreign policy considerations.

It was recognized that science activities in Category I can impact heavily on international relationships and can develop into Category II-type activities. It was further recognized that additional policies are desirable with respect to the manner in which such Category I activities should be conducted to maximize beneficial impact on international relationships. However, other than transmitting these observations to the Board, the Task Force focused its considerations on Category II.

The Task Force recommends that the following three basic policy questions relating to Category II scientific and technological activities be considered by the National Science Board:

1. What should be the posture of the NSF in seeking to influence the selection of the types of science and technology activities initiated by foreign policy considerations?
    a. What additional mechanisms, if any, should NSF develop for the identification, delineation, design, and assessment of probable impact of such activities?

b. How can NSF most effectively influence decision-making regarding the types of such activities initiated?

2. What should be the posture of NSF in seeking its involvement in science and technology activities initiated for foreign policy considerations?

3. What mechanisms should NSF develop for undertaking science and technology activities initiated by foreign policy considerations?

Recognizing that effective international cooperation must take into account the interests, resources, and institutional structures of the participating nations:

a. What additional mechanisms, if any, should NSF develop for the design of such activities?

b. What mechanisms, if any, should NSF develop for program management (including solicitation of proposals, review and selection of projects, and selection of performers)?

c. What additional mechanisms, if any, should be developed for funding such projects and for identifying properly the sources and allocation of funds?

d. What additional mechanisms, if any, should NSF develop for evaluation purposes both of program management and of public impacts?

The Task Force further recommends that the National Science Board consider the following three responses to these questions:

1. The National Science Foundation should seek to influence the selection of the types of science and technology activities initiated by foreign policy considerations and to advise the U.S. Department of State concerning viable options available and the probable impact of such options.

2. The National Science Foundation should encourage its further involvement in science and technology activities of the type identified jointly by the Foundation and the U.S. Department of State as having potential for beneficial impact on science and international relationships.

3. The Directorate for Scientific, Technological, and International Affairs should be requested to study and to recommend to the National Science Board possible mechanisms for more effectively influencing the selection of the types of science and technology activities initiated by foreign policy considerations, for identifying such activities having potential for beneficial impact, and for involving the Foundation further in such activities.

182:18-20

EXCERPT FROM OPEN SESSION MINUTES, 169TH MEETING, JANUARY 16-17, 1975
NSB-75-36, REVISED

(b) International Programs (NSB-74-314--Members' Books, Tab J)

"Special Foreign Currency Science Information Program"--Board approval was requested for those contracts which have exceeded or may exceed $2 million in obligations during fiscal years 1975 through 1977. The Program is financed from two sources: (i) NSF special foreign currency appropriations, and (ii) P.L. 83-480 transfers from other Federal agencies. The Foundation's special foreign currency appropriation for fiscal year 1975 amounts to a dollar equivalent of $4.8 million. Of this amount $1 million will be used to support the Special Foreign Currency Science Information Program. The remainder will be allocated for research, science education, and related activities.

Dr. Nierenberg asked the Planning and Policy Committee to continue to follow through on Dr. Handler's request at the Board's 161st Meeting for increased support of young postdoctoral students to study abroad when P.L. 83-480 funds are considered in the fiscal year 1977 budget request.

The Board unanimously APPROVED the extension and additional funding by the Director at his discretion of the following contracts or other arrangements for translation of foreign scientific and technical publications, utilizing foreign currencies under the Special Foreign Currency Science Information Program for three years:

Contractor	Amount
Central Institute for Scientific Technical and Economic Information, Warsaw, Poland	Not to exceed $200,000 in Foundation funds for each fiscal year plus any additional amount transferred from other agencies during fiscal years 1975, 1976, and 1977

Contractor	Amount
Indian National Scientific Documentation Centre, and Amerind Publishing Company, Ltd., New Delhi, India	Not to exceed $400,000 in Foundation funds for each fiscal year plus any additional amount transferred from other agencies during fiscal years 1975, 1976, and 1977

EXCERPT FROM CLOSED SESSION MINUTES OF THE 195TH MEETING, JANUARY 19-29, 1978 (NSB-78-61--APPENDIX C)

Scientific, Technological, and International Affairs--International Programs

"Extension of Director's Authority to Make Awards for Special Foreign Currency Science Information Activities for Fiscal Years 1978-1980" (NSB-77-514--Members' Books, Tab 23)--Previous Board approval of the Director's authority for making awards for Special Foreign Currency Science Information Activities covered fiscal years 1975-1977. An extension was requested for the next three fiscal years.

Since 1959 NSF has conducted Special Foreign Currency Science Information Activities pursuant to the Agricultural Trade Development and Assistance Act of 1954 (P.L. 83-480), as amended, and Executive Order 10900 of January 6, 1961. The Division of International Programs administers and coordinates the requirements of NSF and other participating Federal agencies. Contracts are made for securing the services of qualified foreign organizations to translate and publish scientific and technological material in English and to prepare a variety of other information products.

Activities under this program are financed from two sources: (a) NSF Special Foreign Currency appropriations, and (b) Special Foreign Currency fund transfers from other Federal agencies. The NSF Special Foreign Currency appropriation for fiscal year 1978 amounts to a dollar equivalent of $1,100,000. Because the total amount of each agency transfer and its allocation among contracts is normally not confirmed until late in the fiscal year, it is not possible to predict the amount of transferred funds to be awarded under individual contracts in any fiscal year. Therefore, authorization was sought for a ceiling limit on the total amount of transferred funds that may be awarded annually under each contract.

In response to questions from the Board, the staff reported that since 1959 the program has spent approximately $43 million and produced over one million pages of translated material during that period. The translations are finished either in bound, soft-cover form printed by the contractor or in photoready copy given to NSF for printing and reproduction in the U.S. Copies of these translations go automatically to the National Technical Information Service of the Department of Commerce where the translations become available to the public in regular printed copies, photocopies, or microfiche.

In response to a question, the staff indicated that the U.S. Special Foreign Currency Program is presently $4.5 to $5.0 million, of which approximately $1.2 million is for translations and information and the remainder for research.

The recommendation from the Programs Committee was unanimous for approval. The Board took the following action upon this recommendation:

NSB/Res-78-34

The Board unanimously APPROVED the extension and additional funding by the Director at his discretion of the following contracts or other arrangements for the translation of foreign scientific and technical publications, utilizing foreign currencies under the Special Foreign Currency Science Information Program for three years, subject to the availability of funds.

Contractor	Amount Not to Exceed
Al-Ahram Publishing House, Egypt	$350,000 in Foundation funds for each fiscal year plus $500,000 transferred from other agencies during fiscal years 1978, 1979, 1980
Franklin Book Programs, Inc., Egypt	$200,000 in Foundation funds for each fiscal year plus $300,000 transferred from other agencies during fiscal years 1978, 1979, 1980
Amerind Publishing Co., Ltd., India	$350,000 in Foundation funds for each fiscal year plus $600,000 transferred from other agencies during fiscal years 1978, 1979, 1980
Indian National Scientific Documentation Centre, India	$50,000 in Foundation funds for each fiscal year plus $100,000 transferred from other agencies during fiscal years 1978, 1979, 1980
Messrs. Saad Publications, Pakistan	$250,000 in Foundation funds for each fiscal year plus $350,000 transferred from other agencies during fiscal years 1978, 1979, 1980

CS:195:38-40

INTERNATIONAL SCIENCE

Task Force 78-B

Dr. Cobb, Chairman, presented the report from Task Force 78-B which is summarized below. The Board received the report and agreed that it should be referred to the Planning and Policy Committee for expeditious consideration.

The Task Force reviewed the context of NSF programs relevant to the LDC's and found a need and desire for an expansion of effort in this area. The Task Force recommended that: (1) NSF undertake substantially enlarged programs of cooperative research in areas of interest both to the U.S. and to the LDC's; (2) NSF undertake a broad range of programs to help build scientific infrastructure in the LDC's; (3) NSF undertake additional studies of the role of science and technology in the development process; (4) the Director seek the resources necessary for NSF to take a leading role in this area.

In making her report, Dr. Cobb cited several general philosophical recommendations from the Task Force: (1) the focus of the programs under consideration should be for time periods measured in decades; (2) short-term political considerations should be avoided; (3) the private sector should be involved in the areas where it can make a contribution; and (4) because regional efforts may often allow a multiplier effect, they are to be preferred over single country efforts, other things being equal.

In the discussion which followed Dr. Cobb's presentation, Dr. Hueg again reiterated his earlier suggestion that the Foundation consider the opportunities afforded by Title XII of the Foreign Assistance Act, P.L. 94-161, in connection with any LDC effort.

It was urged that the Foundation take the initiative in this area with the Congress and the White House without delay.

Dr. Mac Lane expressed doubts about the multiplier effect of regional efforts. This was responded to by several historical examples of the success of such efforts. Although the recommendations of the Task Force encompassed a broad range of programs, the consensus was that the Foundation should take the initiative and volunteer to undertake those programs to which it can make an important national contribution.

At the suggestion of the Chairman, the Board took the following action:

NSB/Res-78-76 The Board unanimously AGREED to receive the report of Task Force 78-B with the understanding that the Chairman will refer it to the Planning and Policy Committee for expeditious consideration and action.

Dr. Cobb expressed her appreciation to the Task Force members, to the NSF staff, and particularly to Dr. Shinn, for their assistance.

The final report of Task Force 78-B is attached as Appendix A.

199:17-18

APPENDIX A
(Attached to
NSB-78-294)

NSB-78-310

REPORT OF TASK FORCE 78-B
The NSF Role in Science and Technology in the Developing Countries
As Received by the National Science Board at its
199th Meeting on June 16, 1978

Objectives: To consider policy options and designs for potential National Science Foundation (NSF) programs of scientific cooperation with the lesser developed countries (LDC's).

Findings: Task Force 78-B reviewed the context of NSF planning with respect to science and technology in the LDC's and found:

A. Clear evidence of Administration and Congressional interest in greater use of science and technology in development efforts.

1. PRM 33 will set overall science and technology policy in this area. All research and development (R&D) agencies will be involved. Support for both research and infrastructure development is expected to be endorsed.

2. A new Science and Technology for Development Foundation (STDF) is being proposed within a rebuilt Agency for International Development (AID). It will have a broad mandate.

3. A larger coordinating role in the science and technology (S&T) area is expected to be given the Department of State in pending legislation. NSF can expect requests to assist in this function.

B. Other countries, both developed and less developed, clearly want a larger U.S. role in cooperative research, infrastructure development generally, and especially science policy development.

1. The Saudi Arabian program is an example.

2. Interest of Greece and Israel expressed to Dr. Harvey Averch on recent trip.

3. United Nations Conference on Science and Technology for Development (UNCSTD) derives mainly from such interest.

4. There is much interest in existing bilaterals.

C. NSF has the capability to develop strong programs in cooperative research and infrastructure building. It is recognized that additional staff and funding will be necessary, but NSF knows how to do both tasks well. All that is necessary are the resources and the commitment to do it.

D. The level of effort in existing NSF programs in the international area is inadequate to meet the expressed interest and need.

Recommendations:

Task Force 78-B considered these findings, and the options discussed in the staff paper prepared for Issue B, and recommends the following:

A. NSF should undertake substantially enlarged programs of cooperative research with LDC's. These programs in general would have the following characteristics:

1. They would be genuinely cooperative efforts, involving both scientists and governments of the LDC's.

2. They would result, more often than not, from LDC initiatives.

3. They would be problem oriented, and deal with problems of interest to individual LDC's or regional groupings.

4. They would usually be applied in nature, although basic research in areas of problem relevance would also be undertaken.

5. They would be interdisciplinary, and would be more like those in the Directorate for Applied Science and Research Applications than like those in the Research Directorates.

B. NSF should undertake, in response to LDC initiative, a broad range of activities generally aimed at building better scientific infrastructure in the LDC's.

1. Examples of appropriate activities include:

   a. Improving and facilitating the education of LDC students in the U.S.

   b. Providing short courses in areas such as science information, computer applications, science policy and management, or instrumentation, in order to make training received in the U.S. more relevant to LDC environment

   c. Faculty exchange programs

   d. Advice and help in developing science and technology education and research institutions in LDC's

   e. Precollege curriculum development and teacher training

   f. Development of science information systems

   g. Science policy assistance

   h. Development of peer review systems for S&T projects

   i. Development of needs assessment procedures.

2. Infrastructure building requires an understanding of the culture of the LDC. NSF will need to seek help from non-scientists in AID, Department of State, academia, or other places which can assist in transplanting scientific ideas and concepts to non-Western settings.

3. Both the Directorates for Scientific, Technological, and International Affairs and Science Education have considerable experience in these areas which can be drawn upon in developing these programs.

C. NSF should undertake a program of studies focused specifically on the role which S&T can play in economic development. As this process becomes better understood, the programs of research and infrastructure development should evolve accordingly.

D. A compendium of past successes in projects dealing with the LDC's should be assembled, in order to serve as a basis for further planning.

E. In view of the developing national interest in this area, the Director is urged to request additional resources, in terms of both funding and staff, to allow NSF to undertake a leading role in developing the necessary programs. Discussions with both the Administration and the Congress should seek sufficient resources to allow effective programs to be developed and executed in a timely manner.

Other Considerations:

A. Several general philosophical considerations are:

1. The focus should be resolutely fixed on long-term payoffs. Time periods measured in decades will be necessary. Promises of short-term gains should be avoided.

2. Short-term political considerations should be avoided as much as possible. The focus in long-term results requires sustained efforts over time, and cannot be maintained if fluctuations in diplomatic relations are allowed to dominate. We must seek to build a scientific community, based as fully as possible on scientific considerations in the LDC's.

3. Many things can be done best by the private sector, and should be left to it. Specifically, NSF should avoid involvement directly in transfer of commercial or industrial technology.

4. Regional efforts may often allow a multiplier effect, and are to be preferred over single country efforts, other things equal.

B. Finally, it should be recognized that the distinction between supporting research and supporting infrastructure is conceptual. In practice, many projects and most programs should serve both major goals in some degree, even though oriented primarily towards one or the other.

Prepared by Dr. Allen M. Shinn, Jr.
Executive Secretary, Task Force 78-B

Approved by Dr. Jewell P. Cobb,
Chairman, Task Force 78-B

July 24, 1978

INTERNATIONAL SCIENCE

Planning and Policy Committee (PPC)--Fifty-sixth Meeting--November 15, 1978

Dr. Hubbard, Chairman, stated that the PPC discussed plans for the November long-range planning meeting, NSB regional forums, and the report of the PPC Subcommittee on International Science Activities, "Recommended NSF Initiatives Towards Lesser Developed Countries in Fiscal Year 1979."

The PPC Subcommittee on International Science Activities met with representatives from the major NSF directorates on September 21 and October 19 to consider initiatives NSF could undertake with respect to the Lesser Developed Countries (LDC's). The Subcommittee proposed and the PPC accepted the recommendations listed below as well as certain specific criteria for initiating any further NSF activities pertaining to LDC's.

(1) Expand the SEED Program (STIA);

(2) Provide Dissertation Improvement Grants to LDC students (STIA);

(3) Establish a visiting scientists program (STIA),

(4) Encourage cooperation with LDC scientists in areas of mutual interest (BBS);

(5) Continue existing planning efforts in science education (SE);

(6) Endorse concept but defer program of short courses for LDC students (SE) until current SE planning study is completed and until funds are available;

(7) Defer establishment of a program of cooperative research to aid developing countries (ASRA) until after further coordination with the Foundation for International Technological Cooperation (FITC).

Based upon the PPC's recommendation, the Board acted as follows:

NSB/Res-78-112	The Board APPROVED the criteria for expanding present and initiating new programs with respect to the Lesser Developed Countries and AUTHORIZED the initiation of the specific program activities recommended by the Subcommittee on International Science Activities of the Planning and Policy Committee.

METRIC SYSTEM

Dr. Murray proposed the following resolution, which the Board adopted:

> Whereas most of the major countries of the world have previously adopted and converted to the international metric system; and whereas various bills have been introduced in the Congress of the United States providing for the metric system; and whereas the National Science Foundation has consistently endorsed various versions of such bills;
>
> The National Science Board unanimously ENDORSED current Administration and congressional efforts to convert to the metric system and CITED the readiness of the National Science Foundation to assist in the transition through its programs in science education and training.

156:21-22

MATHEMATICAL SCIENCES RESEARCH INSTITUTE

PROPOSED MATHEMATICAL SCIENCES RESEARCH INSTITUTE

Dr. Krumhansl read a statement reviewing briefly the history of the proposed Mathematical Sciences Research Institute (NSB-78-374--distributed at the meeting), and indicating that the Project Announcement for that Institute will be revised. The revision will provide for an evaluation of the proposed "...Institute in direct competition with other modes of support of research in mathematics..." and will state that "...no Institute will be recommended for funding unless a truly outstanding proposal is received." Dr. Krumhansl's statement also reported on the meeting at NSF on July 7 of an ad hoc group of mathematicians to discuss the Foundation's support of mathematics.

Dr. Mac Lane then provided a memorandum (NSB-78-379, Revised) containing information on the background of the situation in American mathematics, on the Board action in March, on events subsequent to that action, and on his own judgment of the situation. He also read several statements from other leading mathematicians, beginning by quoting a letter of September 16, 1978, from Professor Serge Lang of Yale University:

> In one context, I do not recognize anyone at present, ranging from Joe Kohn to Mac Lane, as a spokesman for the mathematical community on the issue of the institute.

The statement Dr. Mac Lane read on behalf of Professor J. J. Kohn of Princeton University included the resolution passed by mail vote of the Council of the American Mathematical Society on September 15, 1978:

> The Council of the American Mathematical Society respectfully requests the National Science Board to hold in abeyance any action on the Mathematical Sciences Research Institute until the mathematical community has had an opportunity to consider this matter at its 1979 Winter Meeting.

Professor Ronald R. Coifman of Washington University and 55 other mathematicians were among those attending an NSF-supported summer institute in Fourier Analysis. On July 26, 1978, they wrote a letter to Dr. Hackerman about plans for the Institute. The statement read by Dr. Mac Lane on behalf of Professor Coifman was the first paragraph of that letter, which ended with the sentence:

> We, therefore, ask that no commitment be made by the National Science Board until the mathematical research community has had an opportunity to formulate adequately and voice its opinion with regard to funding priorities and/or new research commitments.

Dr. Mac Lane then read a statement on behalf of Professor Felix E. Browder of the University of Chicago. This statement commented on the discussion in the mathematical community and observed that:

1/ Important Notice No. 74 was issued on September 28, 1978.

> ...there has been a solidification of sentiment on the part of a significant sector of the mathematical community that not only is the Institute proposal potentially of great value in fostering mathematical research... but it is even true that the process of organizing and competing for a potential Institute would have an important catalytic effect....

All of the above persons, except Professor Lang, and several other mathematicians were present as visitors to the Board meeting. They were introduced by Dr. Mac Lane.

After reading these three statements, Dr. Mac Lane observed that there was evidently a widespread feeling in the mathematical community that there has not been sufficient information generally available about the possible Research Institute. He outlined steps now under way to provide more information to the community. He stated that, in his judgment, Dr. Krumhansl's proposed revised Project Announcement for a Research Institute is an appropriate one; issuing a Project Announcement at this stage does not constitute a decision among the options.

Dr. Hackerman then summarized the discussion as follows: The National Science Board has approved the Project Announcement for a Mathematical Sciences Research Institute at its March 1978 meeting. Dr. Krumhansl's statement suggests that the form of this Announcement will be such that the review and selection process will not take place prior to the meeting of the American Mathematical Society in January 1979. Hence, the Foundation is not yet committed to a decision between an Institute and other options for the support of mathematical research.

SCIENCE EDUCATION

COLLEGE SCIENCE IMPROVEMENT PROGRAM

Dr. Phillips said that the rapid increase in the number of junior colleges and in the proportion of the total student population attending junior colleges has made it advisable to alter the ground rules for the College Science Improvement Program (COSIP) to include these institutions as potential beneficiaries of this Program. He proposed that groups of junior colleges, in association with major (preferably graduate degree-granting) institutions, be declared eligible to apply for COSIP support.

Dr. Tyler, Chairman of Committee III, reported that his Committee had considered this matter at its meeting the previous day and had agreed that such an alteration in rules would be desirable and so recommended to the Board.

> **The Board unanimously APPROVED a revision in the eligibility requirements of the College Science Improvement Program to include junior colleges working with four-year institutions.**

117:4

POLICY ON INCOME GENERATED FROM EDUCATION GRANTS

The Director called attention to a revised policy on the disposition of income generated under Foundation education grants and contracts to become effective immediately, as set forth in NSB-71-327 (Members' Books, Tab S). Income will be applied to offset costs of grant activities as well as costs of administration of the income-producing properties. When income is not expected to exceed $10,000, the grantee may keep and apply to research and education in the sciences amounts remaining after offsetting costs. However, any income remaining after payment of costs, which exceeds $10,000, will be remitted to the Foundation. Where total income is estimated to exceed $10,000, the grant will provide specifically for disposition of income. Income not used as provided for in the grant will be remitted to the Foundation. With respect to contracts, income received will normally be applied to offset costs chargeable to the contract, and any income not so used shall be remitted to the Foundation.

143:15

POSTDOCTORAL RESEARCH FELLOWSHIPS FOR NEW PH.D.'S

The Board authorized the staff to develop a program of postdoctoral research fellowships for new Ph.D.'s for the purpose of giving young people a chance to start research programs of their own. The Board proposed the following provisions: (a) such fellowships to be awarded on a competitive basis for tenures of three to five years; (b) only limited teaching duties to be permitted; (c) salaries to be slightly below those of assistant professors to encourage migration into regular faculty positions; (d) such persons to serve at either educational or nonprofit institutions; and (e) some 500 awards to be made annually amounting to approximately $20 million.

ES:148:7

REPORT OF AD HOC COMMITTEE ON SCIENCE EDUCATION

The Board Chairman introduced the discussion of the report of the Ad Hoc Committee on Science Education by repeating his charge to the Committee. He welcomed our beloved former colleague, Dr. Robert S. Morison, who served as a consultant to the Committee with Dr. March, Chairman, Dr. Fowler, Dr. Harrison, and Dr. Press. Mrs. Mary L. Parramore served ably as the Executive Secretary of the Committee.

Dr. March's summary of his presentation of the report (NSB-73-38 and 39--Members' Books, Tab B) follows.

The Committee report and Dr. Harrison's memorandum of January 26 (NSB-73-37--Members' Books, Tab B, but not available for discussion by the Committee) are only two of several documents dealing with the future of science education at the Foundation. These other documents include reports from the Advisory Committee for Science Education (1970[1] and 1972[2]), the draft working paper prepared by a joint task force of the Office of Science and Technology (OST) and the Foundation,[3] and a background document on the education programs for the NSF fiscal year 1974 budget.[4] These reports are not in agreement on all issues.

Dr. March identified two "grand" and three serious issues running through the Board Committee's discussions and the various reports. The grand issues are:

a. Is there a role for the National Science Foundation in science education?

b. Is there a role for the National Science Board in science education?

Although it certainly is possible to answer these questions negatively, he assumed that the Board would, after discussion, decide to answer each question affirmatively. He deemed this a valid assumption.

The serious issues are:

a. Is there a problem of scarcity and, if so, what are the priorities? The documents the Committee considered reflect three significantly different perspectives. The first (represented best by the 1970 Advisory Committee report) essentially denies scarcity. It suggests that what the Foundation needs to do is to expand present programs. The second (represented best by the task force report and the budget) accepts scarcity, argues that graduate/research training is in good shape and that the Foundation should give priority to other things. The third (represented best by the Board Committee report and the 1972 Advisory Committee report) accepts scarcity, and argues that the first priority should be high quality doctoral and postdoctoral programs. On this issue the Board Committee appeared to be in sharp disagreement with at least part of the staff.

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[1] "Science Education--The Task Ahead for the National Science Foundation" (NSF 71-13).

[2] NSB-73-42.

[3] "Science Education: Problems and Suggested Programs" (October 1972).

[4] "Science Education Improvement--A Program Prospectus for Fiscal Year 1974" (prepared by the Education Directorate--September 1972).

b. What should be the management philosophy in making a connection between quality research and responsibility for science education? The Board Committee report is much more insistent on linking research and education than the other reports. It is much more inclined to favor a decentralization of managerial responsibility to research centers and a decrease in direct project control within the Foundation. On this issue, the Board Committee appeared to be in sharp disagreement with at least part of the staff.

c. To what extent do the problems of women and ethnic minorities in science require explicit acknowledgement and action? It is hard to say what differences, if any, exist here. The Committee felt that the Board should be explicitly on record.

The Committee tried to draft resolutions that confronted the serious issues as pointedly as possible. The Committee did not believe the resolutions (attached as Appendix A) were innocuous.

The other members of the Committee stated their personal positions. Dr. Harrison explained her memorandum setting forth an alternate set of resolutions and questions (attached as Appendixes B and C) designed to point up major issues for discussion. The Harrison resolutions set forth clearly the NSB and NSF roles in science education "at all levels;" recommend the inclusion of a comprehensive survey of science education as a part of the annual report of science indicators; assign the highest priority to the development of the best research and innovative talent with high priority also to be given to science literacy; and finally propose support of research on learning processes and the use of science and technology to improve the efficiency and effectiveness of education.

In the extensive discussion which followed, the Director and the staff outlined the differences among the documents mentioned by Dr. March, the staff's views, and the Administration's posture.

Some principal issues and questions emanating from the discussion are recorded below:

a. All shared the view that the Foundation's programs in science education should be maintained at the highest possible level.

b. There was a difference of opinion, however, on how Foundation support could most effectively be furnished and what should be the priorities.

c. Statutes currently in force return responsibility to the student to pay for his education (notably, loans provided via Basic Opportunity Grants from the Department of Health, Education, and Welfare). Should Foundation programs follow this pattern? Is the current NSF policy to provide support of graduate students mainly through the mechanism of research assistantships?

d. Should limited funds be restricted to direct student support at, for example, the graduate level? Students assigned to research projects would benefit considerably from receipt of independent funds.

e. Is it the responsibility of the Federal Government to support any individual who aspires to achieve a graduate education in science? (See also items m. and n.)

f. Should the Foundation be concerned solely with quality with lesser emphasis on quantity?

g. Is the Foundation taking appropriate action to implement the 1972 amendments to the Act " . . . to initiate and support . . . science education at all levels. . ."?

h. There is the ever present supply/demand controversy. Do Federal fellowhsips change measurably the student enrollment proportions and totals?

i. There is the priority issue. Is it sensible to espouse a program which would tend to concentrate science education in the large research-oriented universities? (This might well be the effect of Resolution Number 2.)

j. Is that Resolution Number 2 a pure policy statement or does it contain a proposed program? (The Committee Chairman felt strongly that it was the former, a kind of "revenue sharing.")

k. Would the proposed Committee resulotions add further constraints on the staff in administering and defending the science education programs?

l. Are the Committee's recommendations minimal and an interim statement and the Harrison resolutions aimed at the longer time span?

m. Is it the right of every individual to experience science education in a way that is most constructive to that individual? What is the role of the Federal Government and the Foundation in this regard?

n. Should the Foundation continue in science education at all, since (1) that program is so extremely controversial, and (2) it is the position of the current Administration that it is not the responsibility of the Federal Government to underwrite the career development of individuals?

At the end of the morning, a vote was called for on the Committee resolutions. After a complicated parliamentary situation on amendments offered, some of which were accepted, the Board acted as follows:

> The Board ACCEPTED as the policy of the Foundation the resolutions offered by the Ad Hoc Committee on Science Education, as amended (attached as Appendix D).

Seven Board Members voted for the resolution, five voted against, and two abstained.

- AFTERNOON -

Dr. Heyns, acting as Chairman in Dr. Carter's absence, stated that the discussion of science education during the morning session was incomplete in the sense that a number of important policy questions remained to be considered. Hence, that discussion was simply the first step in a sequence of events aimed at a comprehensive review of the total program and premature decision regarding a portion thereof would be unwise. Another important factor was that, since only a relatively small number of Board Members were present due to the late scheduling of this meeting, action might not accurately reflect the disposition of the entire Board. Therefore, it seemed desirable not to have final Board action prematurely on a portion of a policy statement which might be altered later by further deliberation.

Dr. Thieme then recommended reconsideration of the Board's action of the morning for the following reasons: (a) it was inappropriate to have a basic science policy concerned with support of excellence versus breadth embedded in a resolution pertaining only to science education; (b) the greater utilization and involvement in science of women and minority groups is also a broad issue and should be considered in the context of all Foundation programs, not confined to those in education; (c) the policy statement in Board Committee Resolution Number 2 and its proposed institutional grants for education should be considered at greater length and (d) the staff should carefully review all recommendations and present its views to the Board.

Upon motion of Dr. Thieme, who had voted for the prior resolution:

> The Board AGREED to reconsider its prior action accepting four resolutions proposed by the Ad Hoc Committee on Science Education as amended by the Board.

All Members voted for the above resolution except that Dr. Hackerman, who had been absent from the morning discussion, abstained and Dr. March voted against it.

Upon motion of Dr. Campbell that further discussion be deferred to the next Board meeting to permit adequate reflection by the Board, the Director, and the staff:

> The Board unanimously AGREED to continue the discussion of the Foundation's educational policy at the March Board meeting.

ES:153:1-6

DRAFT

APPENDIX D

RESOLUTIONS PROPOSED BY AD HOC COMMITTEE ON SCIENCE EDUCATION
AS AMENDED BY THE NATIONAL SCIENCE BOARD IN DISCUSSION

Policy Resolution 1

RESOLVED that it is the policy of the National Science Board that the highest priority, but not the only one in science education shall be the continuing development of exceptionally high quality doctoral and postdoctoral programs to produce the best basic andapplied research talent in the country. Whatever else is done, this must be done.

Policy Resolution 2

RESOLVED that it is the policy of the National Science Board that the connection between outstanding research and responsibility for science education shall be strengthened. Toward this end, through a variety of mechanisms, a substantial proportion of NSF support for science education activities shall be provided to institutions, including nonacademic institutions, in approximate proportion to the support they receive from NSF through research projects, RANN projects, and the Experimental R&D Incentives Program. The primary thrust of such expenditures shall be to improve the quality and diversity of science education.

Policy Resolution 3

RESOLVED that it is the policy of the National Science Board that, after adequate funds have been allocated for the purposes outlined in Policy Resolutions 1 and 2, the National Science Foundation shall give precedence to: (a) monitoring and reducing other disparities between needs and competencies within the science establishment; (b) monitoring and increasing scientific literacy; and (c) exploring, evaluating, and encouraging possible improvement in education through use of science and technology.

Policy Resolution 4

RESOLVED that it is the policy of the National Science Board that special attention shall be paid through programs in science education to identifying and eliminating educational barriers to the recruitment and development of talent in science and technology. Particular effort shall be made to resolve the special problems involved in science education for women and American ethnic minorities.

February 15, 1973

ES:153:16-20

OBJECTIVES SCIENCE EDUCATION PROGRAMS

Education

Dr. Cooke, Acting Chairman, reported that the Planning and Policy Committee had carefully reviewed the Board's discussion at its last meeting on education; reconsidered the amended resolutions proposed by the Ad Hoc Committee on Science Education which had been tabled at that meeting; and discussed an alternate set of resolutions of March 13 proposed by the Director (NSB-73-77--distributed at the meeting). For this discussion the Planning and Policy Committee was supplemented by Dr. Harrison and Dr. Press.

The Committee decided that a more satisfactory procedure for the consideration of the education program would be first to formulate the objectives to be attained, then to develop programs and activities to implement these principles. Dr. Cooke presented four objectives in priority order which the Committee had developed. Further, the Committee proposed that the Board Chairman appoint a permanent committee or subcommittee on education to guide the Board's development of that segment of the Foundation's program and to serve as liaison with the staff.

Dr. Cooke then formally moved that the original motion be amended by substituting the four proposed objectives for the tabled revised resolutions of the Ad Hoc Committee on Science Education. The Director seconded the motion.

(Revised)

> The Board unanimously RESOLVED to substitute the objectives proposed by the Planning and Policy Committee as a guide for the Foundation's role in science education in place of the policies set forth in the resolution which was the subject of reconsideration at the 153rd Meeting of the Board.

It was then moved and seconded that the original motion as so amended be approved and:

> The Board unanimously RESOLVED that the motion to adopt policies relating to education as so amended to substitute stated objectives be adopted (final text attached as Appendix C).

The Board Chairman agreed to appoint a permanent committee or subcommittee on education as proposed by the Planning and Policy Committee.

The Director raised the question of the public release of these objectives, but it was decided that publicity at the present time was premature as these were still interim working documents.

APPENDIX C

OBJECTIVES
SCIENCE EDUCATION PROGRAMS
NATIONAL SCIENCE FOUNDATION

Objective 1

That it be the policy of the National Science Board that the highest priority of the National Science Foundation, in its programs of science education, shall be the development of exceptionally high quality doctoral and postdoctoral programs to produce the best basic and applied research talent in the country.

Objective 2

That it be the policy of the National Science Board that the connection between outstanding research and responsibility for the education of scientists shall be strengthened.

Objective 3

That it be the policy of the National Science Board that the National Science Foundation shall support programs designed to: (a) monitor and increase scientific literacy; (b) explore, evaluate, and encourage possible improvement in education through use of science and technology, including the support of research on the process of human learning; and (c) monitor changing scientific manpower needs and provide training which prepares scientists and engineers to contribute to the solution of national problems.

Objective 4

That it be the policy of the National Science Board that special attention shall be paid through programs in science education to identifying and finding ways to reduce educational barriers to the recruitment and development of talent in science and technology. Particular effort shall be made to resolve the special problems involved in science education for women and disadvantaged minorities.

March 16, 1973

ES:154:21

BOARD STATEMENT ON COMPUTER ASSISTED INSTRUCTION

Dr. Hackerman stated that the enthusiasm of the staff and the PLATO demonstrators was not shared by all members of the Committee. Although CAI has not been proven to be a better teaching tool than conventional instruction, it does appear that this system may be superior for certain types of students. Most CAI experiments have suffered from lack of ingenuity. Early stages of these experiments were particularly attractive because of their low cost per student hour; later estimates have soared. However, it is important, now that these experiments have been undertaken, that funding be adequate to make them valid and provide thorough evaluations.

159:6

SCIENCE FACULTY FELLOWSHIP PROGRAM

Dr. Handler voiced strong objection to the use of $1 million released funds to reactivate the Science Faculty Fellowship Program for the sole purpose of offering fellowships to persons "whose planned activity is related to one or more national problems." He stated that such an action is a distortion of the values and ideals which the Board had enunciated in its various reports to the Congress and which the Foundation had upheld through its actions over the years. Several other Members expressed their concern also and inquired whether it would be possible to broaden the program as time goes by.

Dr. Paige outlined the background of recent transactions with OMB, indicating he too disliked targeted funds. In the negotiations with OMB on the fiscal year 1975 budget, Dr. Paige felt that he had no alternative but to agree to the OMB mandate with respect to 1974 funds but that he planned to administer such funds as liberally as possible.

Upon the suggestion of Dr. Brooks, the Board acted as follows:

> The Board APPROVED the undertaking of a Science Faculty Fellowship Program related to important societal problems, as outlined in NSB-73-310 (Members' Books, Tab E), with the understanding that: (1) the Director would express to OMB the concern of the Board with respect to the exclusivity of the earmarking of funds for certain types of fellowships; and (2) the Director and the staff would attempt to secure a gradual partial release from such commitments in the future.

ES:161:7-8

RESOLUTION ON SCIENCE CURRICULA

Dr. O'Neal, Chairman, reported that the Committee had reviewed the material provided by NSF's Science Curriculum Review Team, Volume I of its report, *Pre-College Curriculum Activities of the National Science Foundation*, and the recommendations of the Advisory Committee for Science Education.

The Ad Hoc Committee submitted to the Board its report (NSB-75-209, Revised--June 18) containing comments on the observations and the policy issues in the report of the Review Team and proposing three policy statements for the Board's consideration. Comments on the six observations assess the effectiveness of the management and operation of the program. The Ad Hoc Committee's comments on the five policy issues follow:

a. Policy Issue 1: Redefinition of the NSF Role in Science Curriculum Development

This has been discussed many times in various forms. It is the consensus that NSF must direct its efforts to both the education of future scientists and science education for all and should also consider the needs of the science-related professions. No fixed position as to balance can be established at this time.

b. Policy Issue 2: Determination of Future Needs

It appears desirable to carry out the proposed broad-based analysis of future needs. An essential first step, however, is a need to establish baselines for science education, i.e.. clearly establish the current status of science education. A program of pre-college education should be based on consciously determined needs as well as individual, innovative proposals.

c. Policy Issue 3: Awards Process

The awards process should involve:

(1) Broad dissemination of a program;
(2) Competitive processes of selection;
(3) A disposition to award several contracts or grants in response to a particular need depending on the nature of the educational process, the frequent presence of substantially different proposals, the need for providing a range of options for schools and avoiding the impression of nationally mandated curricula.

d. Policy Issue 4: Proposal Review and Project Evaluation

The Ad Hoc Committee concurs. It is noted that it would be better stated to say that procedures "should" be strengthened, rather than "could".

e. Policy Issue 5: Curriculum Implementation

The consensus was that NSF should be involved through "facilitating free choice". The Ad Hoc Committee believes that NSF should support activities designed to facilitate the spread of information on and the effective use of innovative materials and classroom practice.

With respect to the termination of a development/implementation curriculum activity, the Ad Hoc Committee recommended that the policy for terminating RANN projects as proposed in NSB-71-252 be modified to be applicable to educational programs.

Dr. O'Neal then presented the three proposed policy statements on pluralism in education, curriculum development, and NSF implementation of science curricula.

In the discussion which followed, the Board proposed some changes in emphasis and language, and requested the Ad Hoc Committee to revise the statements for further consideration the following day.

ES:174:11-13

RESOLUTIONS ON SCIENCE CURRICULA

First, Second, and Third Meetings--June 9, 18, and 19--Dr. O'Neal, Chairman, advised that the Committee had reviewed the material provided by NSF's Science Curriculum Review Team, Volume I of its report, Pre-College Curriculum Activities of the National Science Foundation, and the recommendations of the Advisory Committee for Science Education. Dr. O'Neal submitted to the Board a report of the Ad Hoc Committee with recommended policy statements on curriculum development, implementation, and pluralism in education.

After discussion the Board took the following action:

> The Board unanimously ACCEPTED the report of the Ad Hoc Committee on Science Curriculum Review, ADOPTED the policy statements as presented by the Committee (attached as Appendixes A, B, and C), and AUTHORIZED the Board Chairman to disseminate the statements as he deems appropriate.

In the discussion of the report and the policy statements the Board indicated it still favored appropriate experimentation in curriculum development.

174:7

APPENDIX A

NSB-75-226

POLICY STATEMENT ON CURRICULUM DEVELOPMENT ACTIVITIES OF THE NATIONAL SCIENCE FOUNDATION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 174TH MEETING ON JUNE 20, 1975

For 20 years the National Science Foundation (NSF) has been, with the support of the Administration and the Congress, a leading instrument for the improvement and strengthening of school science curricula and of school science teaching. When NSF came on the scene, science teaching materials and practices were often uninspiring and outdated. At the same time, world society and American conditions were changing in a fashion which required a population better educated in science. NSF programs for the improvement of course materials in biology, chemistry, earth sciences, mathematics, physics, and social sciences have provided important examples to meet this objective. Compared to the total financial resources of the school operation, the NSF effort has been small; but it has brought together scientists and educators in an effective manner to provide the needed new science materials and institutional practices.

The statutes defining the responsibilities of the National Science Foundation are explicit in directing NSF to strengthen science education at all levels. The strength of science education throughout the Nation depends in no small way upon the quality and character of course materials and instructional practices available to the individual teacher.

The National Science Foundation has a continuing role in the development of course materials and teaching methods in the mathematical, physical, medical, biological, engineering, social, and other sciences at the pre-college level. NSF can and should make a unique contribution by bringing new, intellectually challenging science content and teaching methods to elementary and secondary school students and their teachers. The program should be broadly aimed at encouraging future scientists and technologists as well as increasing the quality of science education available to all students at the pre-college level.

APPENDIX B

NSB-75-227

POLICY STATEMENT ON IMPLEMENTATION OF SCIENCE CURRICULA BY THE NATIONAL SCIENCE FOUNDATION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 174TH MEETING ON JUNE 20, 1975

State and local authorities have final responsibility for the selection and adoption of educational materials and practices. Ideally such selection is based upon adequate information about available alternatives. The National Science Board therefore affirms a continuing role for the National Science Foundation (NSF) in supporting activities designed to disseminate widely information about available alternatives and to assist members of the educational community in the use of new, innovative, and scientifically sound materials and practices in which they have demonstrated an interest.

Prior to undertaking full-scale dissemination and assistance activities for NSF-developed materials, NSF should undertake a careful review to ensure that the proposed subject matter fits within reasonable limits or norms with respect to educational value and that the scientific content is accurate. Recognizing the broad base of concern with elementary and secondary education, NSF should provide opportunities for input in this review by representatives of the scientific, educational, child development, commercial publishing, and informed public communities.

APPENDIX C

NSB-75-228

POLICY STATEMENT ON PLURALISM IN EDUCATION ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 174TH MEETING ON JUNE 20, 1975

The National Science Board recognizes that much educational innovation is, by its nature, controversial. It therefore follows that, if the educational mandate of the National Science Foundation (NSF) is to be carried out, NSF cannot, and should not attempt to, avoid controversy in the development and implementation of new materials. The Board notes that:

1. The United States is deeply committed to pluralism in education.

2. The National Science Foundation, in order to strengthen science education at all levels, has supported the development of science course materials for use in the schools. NSF is further committed to assisting those with final responsibility for selection of course materials by creating conditions allowing choices to be made among scientifically sound alternatives through widespread dissemination activities and to assist in implementing those choices.

As a consequence of this pluralistic value system NSF should disseminate as many alternatives as are feasible and necessary, given the diversity of views and needs.

To ensure that Federal funds do not directly or inadvertently lead to the development of a monolithic curriculum structure, and to ensure the diversity that society requires, the following procedures are recommended:

1. The National Science Foundation should carry out a broad-based analysis of future needs in subject areas and publicize such needs.

2. The National Science Foundation should ensure competitive selection of project developers addressing these needs.

3. The National Science Foundation should encourage development of alternatives by NSF.

4. The National Science Foundation should establish administrative procedures in the implementation stage that will avoid any appearance of indoctrination or coercion.

174:11-13

GRADUATE STIPENDS

Present guidelines limit supplementation in the first year of residency to $1,000 for a 12-month tenure but have no such limit on the second and third years. There does not appear to be any reasonable rationale for continuing this policy, and in view of inflationary pressures the guidelines should be changed to allow equal treatment throughout the term of the fellowship or traineeship.

> The Board unanimously APPROVED the following revised stipend supplementation guideline for NSF graduate fellowships and traineeships effective immediately:
>
> > The institution may, if it deems such action desirable, augment stipends for National Science Foundation Fellows or Trainees from institutional funds in such amounts as are in accordance with the supplementation policies of the institution.

175:13

PROGRAM POLICIES FOR CAUSE

"Comprehensive Assistance to Undergraduate Science Education (CAUSE) Program"--Dr. Reynolds reported briefly on the background of the proposed new CAUSE Program. Several institutional development programs, including the College Science Improvement Program (CoSIP), were terminated by the Foundation in fiscal year 1972. The Congress in the NSF authorization act (P.L. 94-86) for fiscal year 1976 authorized and directed the Foundation to implement CAUSE. It is expected to receive a budget of $10 million in fiscal year 1976. Proposed guidelines for CAUSE will be discussed with scientists and educators in many parts of the country. Subsequently, a program announcement will be published reflecting these discussions.

The Programs Committee recommended approval.

> The Board unanimously APPROVED the program policies for the Comprehensive Assistance to Undergraduate Science Education (CAUSE) Program as exemplified by the draft guidelines contained in NSB-75-266 with the understanding that the final guidelines will be written in the light of dialogues with representatives of the academic and scientific communities; further, the Board unanimously AUTHORIZED the application to this Program of the Director's general authority to take final action on grants, contracts, or other arrangements.

175:16

NSB-77-219
April 27, 1977

STATEMENT REGARDING THE ROLE OF SCIENCE IN THE PROPOSED DEPARTMENT OF EDUCATION UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 189TH MEETING ON APRIL 21-22, 1977

The possible establishment of a Department of Education in the Federal Government involves a wide variety of considerations, most of them not primarily involving science. The National Science Board therefore takes no position on the issue of establishing such a Department.

The National Science Foundation and the Support of Science

It has been recommended by some that the National Science Foundation (NSF) be made part of a new Department of Education. The National Science Board strongly opposes any such suggestion. The fundamental objective of the Foundation is and should remain the health of basic science in the Nation, including both its research and education components. Science focuses on the creation of new knowledge, and its effective teaching depends on that knowledge. The process of research is an activity distinct from education, and its impact extends far beyond education. Hence, an independent agency is required to manage the Federal role in science effectively.

The present organization has served the Nation well, in part because of the special nature of the policy oversight and quality control responsibility of the National Science Board. Through the National Science Board and the peer review process, a close and effective relationship between the scientific community and NSF has developed. The Board and the Foundation have been remarkably successful in effectively using limited resources to support and develop a high quality basic science program in the United States.

Complementarity Between Scientific Research and Science Education

The argument also has been advanced that the science education component of NSF would form a natural part of the proposed Department of Education, because of a common concern with educational issues. The National Science Board concludes that this would not be in the best interests of science or the Nation, because activities in scientific research and science education are inextricably linked.

In particular, the National Science Board believes that it is important that the initiatives for science education remain close to the science community, for at least three reasons:

1. Science education must reflect current scientific knowledge and techniques. Advances in scientific knowledge occur rapidly, and science education can only be kept current when direct and continuous contact is maintained between the research and science education communities.

2. The science content of science education must be accurate as well as current. Maintaining accuracy as scientific research reports and results are transformed into materials suitable for scientific instruction also requires close contact between the scientific research and science education communities.

3. A major purpose of the science education enterprise is to ensure an adequate and continuous flow of talented people into scientific work. This requires recognition of the unique demands and advantages that accompany a science career. It also requires

well-balanced programs with adequate numbers of well-prepared students in appropriate scientific curricula at the elementary, secondary, undergraduate, and graduate levels, in order to ensure that the Nation's scientific research effort does not falter. The National Science Foundation and the National Science Board are uniquely well placed to ensure that this important function is performed effectively.

Effectiveness and Efficiency in Science Education

By Federal standards NSF is a small agency and the science education activity is a still smaller part of the Federal education enterprise. Yet, despite a small budget, NSF has had major impacts on science education. NSF-supported curricula have revolutionized the teaching of physics, biology, and chemistry in secondary schools. Fellowship programs have been effective; in particular, NSF predoctoral fellows have been shown to be much more highly productive than scientists who have not received fellowship awards. New NSF programs are helping to bring about increased representation of minorities, women, and disadvantaged persons in science.

A manageable scale of operation is important in achieving such successes. The science education activity at NSF is small enough to be effectively managed, yet important enough to receive continual detailed attention from the National Science Board.

Competitive award procedures, which combine fairness with efficiency in the allocation of resources, are also important. These procedures select the best-qualified performers while ensuring proper balance in terms of geographic distribution, support for differing types of institutions, and fairness to individuals from differing groups.

But, above all, major successes with limited funds can be achieved only through careful agreement on objectives and personal communications among scientists and science educators. The experience of the National Science Board and the National Science Foundation has demonstrated that stimulating the best science education efforts demands a delicate balance between the objectives of the scientific community and those of the science education community. It is unlikely that this balance could be maintained in an agency with the divergent priorities and restraints that would be inherent in the much broader mission of general-purpose assistance to education.

The present arrangement provides for an effective linkage between science education and research. It has achieved major successes in the past two decades, despite quite limited resources. The National Science Board strongly recommends that this arrangement be maintained.

PROPOSED DEPARTMENT OF EDUCATION

Dr. Reynolds stated that the proposed letter to OMB dated March 16 was intended to clarify the Foundation's priorities in science education, which are based on its congressionally mandated responsibilities for support of research and scientific research potential and science education programs.

In the discussion of the draft letter, Dr. Harrison asked whether the proposed position of the Board should focus on NSF programs primarily for those who will become professional scientists or whether it should include the broader spectrum of students who simply study scientific subjects as part of their general education.

The response was that the interest of NSF in science education, particularly at the primary and secondary levels, and to a lesser extent in those collegiate programs that are terminal programs, is more related to novel curriculum developmental efforts and the diffusion of this innovation within the educational system than it is related to programs of continuing review and revision of core curricula. This latter role can as well be served by other agencies.

When asked by the Board for comment, the Assistant Director for Science Education stated that he had just been informed that the Administration intended to present its position to the Congress on April 14. It will probably contain a recommendation that all programs in the Directorate for Science Education should be transferred to the proposed Department of Education with the exception of fellowships and the Science and Society Program. In view of this information he recommended that a communication be sent directly to the Executive Office of the President.

On the strength of the information from Dr. Rutherford and since the Board could not draft a final document within the time constraints of the meeting, the Board agreed that its views should be prepared in the form of a position statement which the Board Chairman and the Director could use as a basis for a joint letter. Dr. Hubbard agreed to revise the document accordingly.

The Board then took the following action:

NSB/Res-78-41 — The Board unanimously AGREED to accept the sense of the draft letter prepared by the Planning and Policy Committee as the National Science Board's statement of policy regarding science education within the Foundation to be transmitted jointly by the Board Chairman and the Director to the appropriate person in the executive branch.

CS:196:7-8

APPENDIX E
NSB-78-150

March 30, 1978

STATEMENT OF POLICY OF THE NATIONAL SCIENCE BOARD REGARDING SCIENCE EDUCATION

The National Science Foundation has priorities in Science Education that are based on its mandated responsibilities for the support of research and the utilization of scientific knowledge in technology important to national needs. The following precepts describe these priorities:

--Science Education that is dependent upon the presence of the research environment should continue to be within the National Science Foundation.

--Educational effort which is so dominated by its scientific subject matter that it is dependent upon the subject specialist for its development and for its utilization should remain within the National Science Foundation. The mode of presentation of such subject matter will, of course, continue to require the interrelated supporting effort of specialists in educational research itself.

--Education that is directed specifically at the practitioner of science--such as symposia, scholarly journals and specialized computerized information bases--should remain with the National Science Foundation.

--Educational efforts directed at the electorate, so that they may be better informed about science-related subjects important to their decisions, should continue to be the responsibility of the Foundation as a part of its programs of science for the public. As well, these public-oriented efforts serve to inform the scientist of public attitudes and purposes.

These precepts guide the choice of programs that should, in our opinion, continue to rest within the Foundation; because there they will be best served by being related to the research and technology programs from which they derive; and which are the continuing responsibility of the foundation.

In addition to the foregoing precepts, three general judgments are made:

1) The interest of the National Science Foundation in education particularly at the primary and secondary level, and to a lesser extent in those collegiate programs that are terminal programs, is more related to novel curriculum developmental efforts and the diffusion of this innovation within the educational system than they are related to programs of continuing review and revision of core curricula. This latter role can as well be served by other agencies; given the developmental and disseminating efforts of the National Science Foundation.

2) The advantage of pluralism in the support of science education is as important as the pluralism related to the support of science itself. Where the educational effort is dependent upon or dominated by the research process, it is our judgment that it should remain as a pluralistic rather than a central support base.

3) NSF is concerned with the whole of science, and, in the national interest, receives support on that basis. Education for science is a part of the whole of science. Just as NSF's concerns for science include encouraging research and technology development programs in all departments of Government, so is its concern for science education inclusive and in no sense exclusive. Because of its particular responsibility for cognizance of the national status of all of science and for the support of research in the basic disciplines of science NSF has a singular rationale for decision making in the process of allocating resources to science education.

AN OUTLINE OF SCIENCE EDUCATION ELEMENTS OF THE NSF

A. Efforts directed primarily at education

1. Primary and secondary education (see B 1&2, C 1&2).
2. Collegiate terminal education (as above).

3. Graduate/professional scientific education; to maintain the capacity and creativity of the basic sciences.

4. Practitioner directed education (post-doctoral and continuing); to maintain currency in understanding and utilization of new scientific knowledge.

5. The electorate (to be informed on issues); to improve and maintain a public understanding of science and a public participation in the process of allocating resources.

B. Basic Research Related Education

1. Programs directed at the early identification of future scientists and the support of these persons in order to continue the flow of exceptionally talented young people into the basic science disciplines for the future.

2. Cognitive learning research related to the content of the basic scientific disciplines.

C. Applied and Developmental Research Related

1. The process of innovative curriculum development should continue to be in large part a responsibility of the National Science Foundation for primary and secondary education as well as for collegiate programs not only where the identification and support of future scientists is the objective but as part of enhancement of understanding of science by the public.

2. The dissemination of innovation, including the presentation of novel curriculum organization and content to teachers, should continue to be a responsibility of the National Science Foundation where the subject content is within the disciplines supported by the research programs of the Foundation.

. Technology Diffusion and Evaluation

1. The programs improving access to science information and technology by state and local governments and its utilization should continue to be an educational process based in the National Science Foundation.

2. The programs offering encouragement for more extensive research and development collaboration between universities and industry along with the educational efforts that are necessary to initiate and continue such programs should remain within the Foundation.

3. The informational and educational efforts directed at small businesses in attempting to improve their research participation and the diffusion of their technology should remain within the National Science Foundation.

To reiterate, where the educational process is directly dependent upon the research environment or where the scientific subject matter so dominates the educational effort that it is dependent upon the subject matter specialist, it is our judgment that the National Science Foundation should continue to be responsible for the educational programs that are now within it. On the other hand, where the objective is to maintain continuing review and revision of core curriculum programs it is our judgment that this could very well be managed as effectively by another agency.

Where the educational effort is directed at the professional practitioner of science and engineering or where the effort is to transmit to the public substantive scientific information it is our judgment that there should be no change in the present levels of responsibility within the National Science Foundation.

In all cases, the present policy of interaction and cooperative program development with other agencies of government should be fostered.

NSB-79-80

January 1979

NATIONAL SCIENCE FOUNDATION AND THE SUPPORT OF RESEARCH AND SCIENCE EDUCATION IN THE 1980S POLICY STATEMENT UNANIMOUSLY ADOPTED BY THE NATIONAL SCIENCE BOARD AT ITS 202ND MEETING ON NOVEMBER 16-17, 1978

Agency Mission

The fundamental purpose of the National Science Foundation is to benefit the general welfare by fostering creativity in the pursuit of basic scientific understanding.

This fundamental purpose is enabled by support of:

1. Basic research in the physical, mathematical, biological, social, and other sciences and in engineering;
2. Science education and training to develop new scientific talent;
3. Applied research that links and develops knowledge in ways that enhance its usefulness;
4. Selected activities to improve the understanding of science and its use by all students and by the public;
5. Research resources (facilities) and institutional forms required in the conduct of research.

AGENCY GOALS

The goals of the National Science Foundation are to:

1. SUPPORT RESEARCH on (a) fundamental laws of nature, (b) man and his natural and social environment, and (c) technology-oriented sciences.
   - Provide SUPPORT to the highest quality researchers in areas with significant potential for advancing scientific understanding.
   - Provide RESEARCH RESOURCES AND EQUIPMENT demanded in the conduct of science.
   - Foster EDUCATION AND TRAINING to maintain U.S. scientific leadership in future generations.
2. ENHANCE RETURNS FROM NATIONAL INVESTMENT IN BASIC RESEARCH.
   - Encourage development in those areas of science with EXCEPTIONAL PROMISE for contributing to the resolution of significant problems.
   - Foster greater COOPERATION within national and international communities.
3. IDENTIFY AND RECOMMEND NATIONAL POLICIES DESIGNED TO ENHANCE THE HEALTH AND VIGOR OF THE NATION'S SCIENTIFIC ENTERPRISE.
   - Provide INFORMATION AND ANALYSIS regarding national science and technology capabilities.

- Recommend POLICIES designed to maintain a strong national research capacity.

4. MAINTAIN AND IMPROVE AGENCY EFFECTIVENESS AND RESPONSIVENESS.

   - Encourage EQUAL OPPORTUNITY for participation in science.
   - Foster greater PUBLIC UNDERSTANDING of science and the impact of science on public policy issues.
   - Improve AGENCY MANAGEMENT and ACCOUNTABILITY.

ADVISORY COMMITTEE FOR SCIENCE EDUCATION RECOMMENDATIONS

The Chairman stated that he had advised Dr. Henry O. Pollak, Chairman, NSF Advisory Committee on Science Education, that the Board would consider at this meeting the Committee's recommendations made to the Board at the January meeting. The Chairman recommended and the Board agreed that the Committee on Budget (COB) should consider the first recommendation within the development of the budget.

This recommendation is:

> The NSF should accord a higher priority for science education and significantly increase its funding in substantial increments over the next four or five years. This new level of funding should be achieved without sacrifice of support to other essential Foundation activities.

The Chairman recommended and the Board agreed that the Planning and Policy Committee (PPC) should consider the second and third recommendations and report back to the Board by the May meeting. These recommendations are:

> The NSB should initiate joint studies with the Advisory Committee for Science Education to relate more effectively science education programs to overall Foundation objectives and national needs; and
>
> Following the proposed joint studies, the National Science Board should generate a special major report on science education.

APPENDIX C

NATIONAL SCIENCE BOARD MEETING ATTENDANCE DATA, 1968-1980

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		6/21/68				
119	NSF, D.C.	7/19-20/68	2			22
Exec. Comm.		8/20/68				
120	NSF, D.C.	9/5-6/68	4			20
Exec. Comm.		10/23/68				
121	NSF, D.C.	11/21-22/68	4			20
122	NSF, D.C.	12/13/68	6			18
Exec. Comm.		1/17/69				
123	NSF, D.C.	2/13-14/69	5			19
Exec. Comm.		4/10/69				
124	NSF, D.C.	5/15-16/69	2			22
125	Abby Aldrich Rockefeller Hall, N.Y.	5/29/69	9			15 2/
Exec. Comm.		6/20/69				

1/ Compiled from NSB minutes data.

2/ Special emergency meeting called to discuss candidates for the Directorship of NSF.

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		7/18/69				
Exec. Comm.		8/15/69				
126	NSF, D.C.	9/4-5/69	6			18
127	NSF, D.C.	10/10/69	9			15
128	NSF, D.C.	11/20-21/69	4			20
129	NSF, D.C.	1/15-16/70	6			18
130	NSF, D.C.	3/19-20/70	4			20
Exec. Comm.		4/27/70				
131	NSF, D.C.	5/21-22/70	2			22
Exec. Comm.		6/18/70				
132	NSF, D.C.	9/3-4/70	8			16
133	NSF, D.C.	11/19-20/70	1			23
134	NSF, D.C.	12/17/70	9			15
Exec. Comm.		1/20/71				
135	NSF, D.C.	1/21-22/71	4			20
Exec. Comm.		2/17/71				
136	NSF,D.C.	2/18-19/71	7			17
Exec. Comm.		3/17/71				
137	Kitt Peak National Observatory	3/17-19/71	4			20
Exec. Comm.		4/14/71	6			
138	NSF, D.C.	4/15-16/71				18
Exec. Comm.		5/19/71				
139	NSF, D.C.	5/20-21/71	3			21
Exec. Comm.		6/22/61				
Exec. Comm.		7/14/71				
140	NAS-NAE-NRC Summer Studies Center	7/15-16/71	6			18
Exec. Comm.		8/20/71				
141	NSF,D.C.	9/9-10/71	1			23

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		10/13/71				
142	NSF, D.C.	10/14/15/71	3			21
Exec. Comm.		11/17/71				
143	NSF, D.C.	11/18-19/71	2			22
Exec. Comm.		12/15/71				
Exec. Comm.		1/19/72				
144	NSF, D.C.	1/20-21/72	3			21
Exec. Comm.		3/15/72				
145	NSF, D.C.	3/16-17/782	3	1		20
Exec. Comm.		4/19/72				
146	NSF, D.C.	4/20-21/72	3	1		20
Exec. Comm.		5/17/72				
147	NSF, D.C.	5/18/72	1	8		15
148	National Center for Atmospheric Research, Boulder, CO	6/15-16/72	1	8		15
Exec. Comm.		9/6/72				
149	NSF, D.C.	9/7-8/72	3	8	8	13
Exec. Comm.		10/18/72				
150	NSF, D.C.	10/19-20/72	2			22
Exec. Comm.		11/15/72				
151	NSF, D.C.	11/16-17/72	5			19
Exec. Comm.		12/14/72				
Exec. Comm.		1/17/73				
152		1/18-19/73	1			23
Exec. Comm.		2/14/73				
153	NSF, D.C.	2/15-16/73	6			18
Exec. Comm.		3/14/73				
154	NSF,D.C.	3/15-16/73	2			22

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		4/18/73				
155	NSF, D.C.	4/19-20/73	2			22
Exec. Comm.		5/16/73				
156	NSF, D.C.	5/17-18/73	2			22
Exec. Comm.		6/20/73				
157	Kitt Peak National Observatory, AZ	6/21-22/73	6			18
Exec. Comm.		9/19/73				
158	NSF,D.C.	9/20-21/73	2			22
Exec. Comm.		10/17/73				
159	NSF, D.C.	10/18-19/73	7			17
Exec. Comm.		11/14/73				
160	NSF, D.C.	11/15-16/73	3			21
Exec. Comm.		1/16/74				
161	NSF,D.C.	1/17-18/74	4			20
Exec. Comm.		2/20/74				
162	NSF, D.C.	2/21-22/74	2			22
Exec. Comm.		3/20/74				
163	NSF, D.C.	3/21-22/74	3			21
Exec. Comm.		4/19/74				
Exec. Comm.	5/15/74					
164	NSF, D.C.	5/16-17/74	1	8		15
Exec. Comm.		6/12/74				
Exec. Comm.		6/19/74				
165	Univ. of Michigan Biological Station at Douglas Lake, MI	6/20-21/74	3	8		13
Exec. Comm.		7/15/74				
Exec. Comm.		8/13/74				

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		9/18/74				
166	NSF, D.C.	9/19-20/74	2			22
Exec. Comm.		10/16/74				
167	NSF, D.C.	10/17-18/74	5			19
Exec. Comm.		11/20/74				
168	NSF, D.C.	11/21-22/74	3			21
Exec. Comm.		12/13/74				
Exec. Comm.		1/15/75				
169	NSF,D.C.	1/16-17/75	4			20
Exec. Comm.		2/20/75				
170	NSF, D.C.	2/21/75	7			17
Exec. Comm.		3/20/75				
171	NSF, D.C.	3/20-21/75	2			22
Exec. Comm.		4/20/75				
172	NSF, D.C.	4/21/75	3	1		20
Exec. Comm.		5/14/75				
173	NSF, D.C.	5/15-16/75	4	1		19
Exec. Comm.		6/18/75				
174	Scripps Institution of Oceanography Univ. of Calif. at San Diego	6/19-20/75	2	1		21
Exec. Comm.		7/22/75				
Exec. Comm.		9/17/75				
175	NSF D.C.	9/18-19/75	2	1		21
Exec. Comm.		10/15-16/75				
176	NSF, D.C.	10/16-17/75	3	1		20
Exec. Comm.		11/19/75				
177	NSF, D.C.	11/20-21/75	3	1	1	20

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		12/12/75	3	1	1	20
178	NSF, D.C.	1/14/76	2			22
Exec. Comm.		1/26/76				
Exec. Comm.		2/19/76				
179	NSF, D.C.	2/20/76	7			17
Exec. Comm.		3/17/76				
180	NSF, D.C.	3/18-19/76	4			20
Exec. Comm.		4/15/76				
Exec. Comm.		5/16/76				
Exec. Comm.		5/19/76				
181	NSF, D.C.	5/20-21/76	2	8	6	14
Exec. Comm.		6/17/76				
182	National Radio Astronomy Observatory, Green Bank, W. VA.	6/16-18/76	5	8	1	11
Exec. Comm.		8/19/76				
183	NSF, D.C.	8/20/76	4	8		12
184	NSF, D.C.	9/16-17/76	2	8	5	14
Exec. Comm.		10/13/76				
185	NSF, D.C.	10/14-15/76	4	1		19
Exec. Comm.		11/17/76				
186	NSF, D.C.	11/18-19/76	4	1	5	19
Exec. Comm.		12/15/76				
Exec. Comm.		2/3/77				
187	NSF, D.C.	2/3-4/77	4	1		19
Exec. Comm.		3/16/77				
188	NSF, D.C.	3/17-18/77	5	1		18

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		4/23/77	2	1		21
189	NSF, D.C.	4/21-22/77	2	1		21
Exec. Comm.		5/18/77				
190	NSF, D.C.	5/19-20/77	3	1		20
Exec. Comm.		6/23/77				
191	New Mexico Institute of Mining and Technology	6/23-24/77	4	1		19
Exec. Comm.		7/15/77				
Exec. Comm.		8/18/77				
192	NSF, D.C.	8/19/77	4	1		19
Exec. Comm.		8/26/77				
Exec. Comm.		9/14/77				
193		9/15-16/77	3	1		20
Exec. Comm.		10/20/77				
Exec. Comm.		11/16/77				
194	NSF, D.C.	11/17-18/77	2	1		21
Exec. Comm.		12/19/77				
Exec. Comm.		1/18/78				
195	NSF, D.C.	1/19-20/78	4			20
Exec. Comm.		2/17/78				
Exec. Comm.		3/15/78				
196	NSF, D.C.	3/16-17/78	3			21
Exec. Comm.		4/19/78				
197	NSF, D.C.	4/20-21/78	3			22
Exec. Comm.		5/17/78				
198	NSF, D.C.	5/18-19/78	1		5	23
Exec. Comm.		6/15/78				

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
199	National Center for Atmospheric Research, Boulder, CO	6/14-16/78	1		3	23
Exec. Comm.		7/2/78				
Exec. Comm.		8/16/78				
200	NSF, D.C.	8/17-18/78	3	8		13
Exec. Comm.		9/20/78				
201	NSF, D.C.	9/21-22/78	3	8		13
Exec. Comm.		11/15/78				
202	NSF, D.C.	11/16-17/78	2	8	5	14
Exec. Comm.		12/18/78				
Exec. Comm.		1/7/79				
203	NSF, D.C.	1/18-19/79	2	8	5	14
Exec. Comm.		2/15/79		8		
204	NSF, D.C.	2/15-16/79	4	8	5	12
Exec. Comm.		3/15/79				
205	NSF, D.C.	3/15-16/79	1	8	5	15
Exec. Comm.		4/20/79				
Exec. Comm.		5/16/79				
206	NSF, D.C.	5/17-5/18/79	2			22
Exec. Comm.		6/20/79				
207	Hdqs. Assn. of Universities for Research in Astronomy and Kitt Peak National Observatory, AZ	6/20-22/79	3			21

Number	Location	Date	Number of Members Absent	Number of Vacancies	Number of Consultants Present	Total Number of NSB Members Present, Excluding Director
Exec. Comm.		8/2/79				
Exec. Comm.		8/16/79				
208	NSF, D.C.	8/16-17/79	7			17
Exec. Comm.		9/19/79				
209	NSF, D.C.	9/20-21/79	2			22
Exec. Comm.		10/18/79				
210	NSF, D.C.	10/18-19/79	3			21
Exec. Comm.		11/14/79				
211	NSF, D.C.	11/15-16/79	4			20
Exec. Comm.		12/14/79				
Exec. Comm.		1/16/80				
212	NSF, D.C.	1/17-18/80	2			22
Exec. Comm.		2/20/80				
213	NSF, D.C.	2/21-22/80	4			20
Exec. Comm.		3/19/80				
214	NSF, D.C.	3/20-21/80	3			21
Exec. Comm.		4/4/80				
215			4			20
Exec. Comm.		4/17/80				
216		5/80		8	6	16

APPENDIX D

NATIONAL SCIENCE BOARD COMMITTEE AND STAFFING PATTERNS

NATIONAL SCIENCE BOARD—COMMITTEE AND STAFFING PATTERNS[1]

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Statutory committee: Executive Committee	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).
Standing committees:											
Budget Committee	(3)	(3)	(3)	(2)							
Programs Committee	(4)	(5 6)	(5 6)	(5)	(5)	(3)	(5)	(5)	(5)	(5)	(5).
Task Force on Research Priorities	(3)										
Task Force on Science Education	(3)										
Ad Hoc Subcommittee on Research Facilities	(3)										
Ad Hoc Subcommittee on Environmental Institute	(3)										
Subcommittee on R. & D. Incentives and Assessment				(3)	(3)						
Subcommittee on RMI Program					(3)						
Subcommittee on Energy					(3)	(3 5)	(5)				
Subcommittee on Environmental Programs					(3)	(3 5)	(5)				
Subcommittee on Social Sciences					(5)	(5)	(5)				
Subcommittee on Curriculum Oversight						(5)	(5)				
Institutional Committee	(4)	(4)									
Long-Range Planning Committee	(4)	(5)									
Research Review Committee	(3)										
Education Review Committee	(3)										
Planning and Policy Committee		(5)	(5 6)	(6)	(6)	(6)	(3)	(2)	(2)	(2)	(3).
Policy Agenda Subcommittee				(3)	(3)						
Budget Management Subcommittee				(3)	(3)						
National Science Policy Subcommittee.				(3)	(3)						
Ad Hoc Subcommittee on Manpower Report.				(3)	(3)						
Subcommittee on Mechanisms for Improved Oversight and External Communications.						(2)	(3)				
Ad Hoc Subcommittee on NSF Support of Basic Research in Industry.								(3)	(2)	(3)	
Subcommittee on International Science Activities.								(3)	(2)	(3)	(3).
Subcommittee on Science and Society.										(6)	(6).
Task committees:											
On Budget					(5)	(5)	(5)	(5)	(5)	(5)	(5).
On 8th NSB Report					(5)	(3)	(5)				
On National Science Policy					(3)	(3)	(5)				
On Role of NSF in Basic Research					(3)	(3 5)	(5)	(5)	(5)	(5)	(5).
On Science Indicators					(3)	(3 5)					
On 25th Anniversary and Bicentennial					(3)	(3)					
On Minorities and Women in Science						(5)	(5)	(5)	(5)	(5)	(5).
On Institutional Arrangements for Research.						(3)	(5)				
On 9th NSB Report						(5)	(5)	(3)			
On Mechanisms for Improved Policy Formulation and External Communication.					(3)	(3)					
On 10th NSB Report							(3 5)	(5)			
On 11th NSB Report								(3)	(5)	(5)	(5).
On Science and Society								(3)	(2 5)	(5)	(5).
On 12th NSB Report									(3 5)	(5)	(5).
On 13th NSB Report											(5 6).
On 14th NSB Report											(5 6).
On Audit and Oversight									(5)	(3)	(3).

NATIONAL SCIENCE BOARD—COMMITTEE AND STAFFING PATTERNS[1]—Continued

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Ad hoc committees:											
On 3d NSB Report	(4)	(3 4)	(3)								
On 4th NSB Report	(4)	(3)	(3)								
On 5th NSB Report		(3)	(3)	(3)							
On 6th NSB Report				(3)	(2)						
On Manpower Report					(3)						
On Science Indicators		(3)	(3)	(3)	(3)						
On Incentives Program			(3)								
On Manpower and the Economy		(3)	(3)								
Nominating Committee for Board Officers			(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
To Recommend Board Nominees		(3)	(2)	(2)	(2)	(2)					
On Board Organization				(3)	(3)						
On Research Facilities		(3)	(3)								
On Environmental Institute		(3)	(3)	(3)							
On Science Education			(3)	(3)							
On NSF 20th Anniversary	(3)										
On Bicentennial Celebration				(3)	(3)						
On RANN Policy		(3)	(3)								
On Astronomy				(3)							
On Antarctica				(3)							
On Science Curriculum Review						(3)					
On Peer Review Survey							(3 6)				
On Action Review Boards							(5 6)	(2)			
On House Peer Review Report							(3 5)	(6)			
On Materials Research							(5)				
On Center Directors Salaries							(2)				
On NSB Research Support							(2)	(2)			
On NSF Staff							(2)				
On NSF Staff and NSB Nominees								(2)			
Ad Hoc Committee on Agenda—1								(2)	(2)		
Ad Hoc Committee on Agenda—2								(2)			
On NSB and OSTP Annual Reports								(2)			
On Officers and Elections									(2)		
On Audit and Oversight									(2)		
On Big and Little Science									(5)	(5)	(5)
On Deep Sea and Ocean Margin Drilling										(5)	(5)
On NSF Act Review										(3)	(3)

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[1] Compiled from NSB data. If more than one number appears in a column, the committee staff incumbent changed during the reported year.

[2] NSB staff.

[3] Unknown.

[4] NSF staff, serving as Special Assistant to the Director.

[5] NSF staff.

[6] NSF staff from OPRM

APPENDIX E

STATEMENT OF DR. ROGER HEYNS

HEYNS' STATEMENT ON NSB RESPONSIBILITIES

The Chairman called attention to the draft statement prepared by Dr. Heyns containing the essence of his remarks at the February Board meeting in closed Executive Session regarding recent changes in NSB attitudes and NSF procedures (NSB-76-85--distributed at the meeting).

Following a brief discussion, the Board acted as follows:

> The Board unanimously APPROVED the inclusion in the record of the February Board meeting of the statement prepared by Dr. Heyns as the sense of the Board.

Dr. Heyns was given leave to revise and extend his remarks without further Board consideration before attaching the final document to the Open and Executive Session Minutes of the February meeting.

180:25

PLANNING AND POLICY COMMITTEE--FORTY-FIRST MEETING--MARCH 17

Dr. Reynolds, Chairman, reported that the Committee had completed its consideration of the statement by Dr. Heyns (NSB-76-335) on the oversight responsibilities of the Board, referred to the Committee for consideration by the Board Chairman at the October 1976 Board meeting. The Committee made the following recommendation:

> The Planning and Policy Committee concurs with the statement of Dr. Roger W. Heyns, made at the 179th Meeting of the National Science Board on February 20, 1976, and revised on September 30, 1976 (NSB-76-335). This statement makes clear the Board's intentions with regard to certain oversight responsibilities and provides the basis for understanding them. The Committee recommends Board endorsement. It also notes the Board's ongoing activities, within the Ad Hoc Committee on House Peer Review Report and the Committee on Mechanisms for Improved Policy Formulation and External Communications, regarding peer review as well as evaluation and audit.

Since Board Members did not have copies of NSB-76-335 at that time, no action was taken on the above recommendation.[1/]

[1/] Copies of NSB-76-335 were distributed later in the Board meeting. On March 22 Dr. Reynolds by memorandum transmitted the Committee's recommendations to the Chairman.

188:18

APPENDIX 1

STATEMENT BY DR. ROGER W. HEYNS

The National Science Foundation this year celebrates its Twenty-fifth Anniversary. During these 25 years, by common consent, it has served its intended purpose admirably. The procedures that it followed in its essential activity, that of dispensing funds for the conduct of research to individuals and institutions, have been carefully developed and refined over the years and have been singularly free from external criticism.

In the last decade, the practice of the National Science Board has been to concern itself with broad policy questions. With respect to final approval of grant requests, it has increasingly delegated substantial responsibility to the Director. In the case of new programs, the Board devoted special attention to grant requests, until guidelines of the program were clearly established. Its typical mode, with respect to those final approvals that it retained, has been to evaluate grant requests primarily by means of committees consisting of Board Members. These committees examined particularly any new policy implications of the proposal, its consistency with existing policy, and the procedure used by the staff in arriving at its recommendation. On the substantive merits of the proposal, the Board has relied primarily upon the judgments of the staff and the expert judgments that the staff was required to assemble and utilize appropriately. On a number of occasions this procedure for qualitative evaluation was modified when the Board contained Members with special professional competence in the areas involved.

This posture on the part of the National Science Board was characteristic of governing boards in industry, education, and not-for-profit institutions. There was a general disposition to define management responsibility broadly and interfere in that area rarely.

This situation has undergone marked changes in recent years. Increased accountability and more explicit definitions of the responsibilities of the National Science Board have led to the development of Board committees with special responsibilities. The audit committees in the business world are examples. Shareholder suits and accountability requirements in the public sector have increased the attention that Board Members must give to the monitoring of management. Many of the procedures and practices that institutions have followed for years are coming under attack. Basic assumptions concerning the accuracy and the completeness of reports, for example, have been challenged by actual instances of lack of integrity.

The National Science Foundation and the National Science Board are not immune from these trends. Criticism of long established practices has begun to appear and to be more strident. Instances have occurred of institutional malfunction. The basic assumption of complete integrity has been violated in some instances. The Board, itself, as a consequence, has been less vigilant than it should have been.

As policies and programs of the Foundation have come under criticism, it has become clear that the Board is held ultimately responsible. It is the Board's review and approval that are sought; if changes in policy are required, it is the Board that is expected to make them. Given these responsibilities, it is inevitable that the Board will inform itself in more detail than in the past.

Quite apart from these social currents briefly referred to above and in addition to the institutional malfunctions, some of our problems and, indeed, some of our difficulty in accepting our problems are probably due to our past successful performance. It seems to be a fact of institutional life that problems of institutional effectiveness develop out of habits of success. There is a gradual, often imperceptible, relaxation of drive and diligence. Hard questions are asked less frequently. It is particularly hard for successful organizations to accept the presence of problems and to make the necessary changes in policy procedures and practices that will be required.

It will not be easy, as a consequence, for the staff of the National Science Foundation or for the National Science Board to adjust to the changes that this alteration in climate requires. But there should be no question that there will be an increase in examinations of policy and practice at all levels. There will be an increase in scrutiny and inquiry by the Board into all of the Foundation's operations.

Ultimately, of course, the National Science Board cannot manage; it cannot administer. It remains dependent on the skills, dedication, and integrity of the staff; about none of these attributes is the Board in serious doubt. The oversight function of the Board, however, will be more in evidence, and the effects of the change in emphasis will modify its relationship to the staff of the Foundation. It is intended that this memorandum will make clear the Board's intentions and provide the bases for understanding them.

March 24, 1976

179:23-24

APPENDIX F

REPORT OF THE AD HOC COMMITTEE ON NSF ACT REVIEW

APPENDIX C
(Attached to
NSB-79-465)

NATIONAL SCIENCE BOARD
WASHINGTON, D.C. 20550

November 23, 1979

MEMORANDUM TO CHAIRMAN NATIONAL SCIENCE BOARD

Subject: Report of the Ad Hoc Committee on NSF Act Review

On April 20, 1979, the Chairman of the Board charged the Ad Hoc Committee on NSF Act Review with the "responsibility for recommending to the Board its position on the NSF Act" for the review of the Act by the Subcommittee on Science, Research, and Technology, House Committee on Science and Technology, during the 96th Congress.

The Ad Hoc Committee was further charged that its recommendations to the Board should take into account the preamble of the Act. It states that the Foundation's mission is:

> To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and other purposes.

The report of the Ad Hoc Committee on NSF Act Review, as amended by the National Science Board on November 15, 1979, is herewith transmitted. Its major points are summarized below.

I. The Committee has examined the desirability of changing the NSF Organic Act by observing the degree to which the intent of the Act has actually been achieved. It notes that the present language of the Act has:

- directed the efforts of the Foundation; and
- provided opportunity for accommodation to changing national needs.

The Committee finds that the present language of the Act has accommodated substantial change in the Foundation's programs during the past ten years, and that the planned future activities of the Foundation can be encompassed within the provisions of the Act.

The Committee concludes that the NSF Act of 1950, as amended, allows and encourages adaptation to changing national needs.

The Committee, by implication, recognizes the need for continued evolution of programs and emphasis within NSF, and by inference suggests that changes in the language of the Act should meet the test of even further enhancing flexible responsiveness.

II. The Ad Hoc Committee notes the differing provisions of the Act with respect to "basic" and "applied" research, and the widespread discussion of these terms.

The Committee views science as a continuum ranging from basic to highly applied and finds the terms "basic" and "applied" dangerous because they indicate a non-existent separation within science; their validity as analytical descriptions is accepted.

Science has a social purpose: the increase of understanding to solve national problems. It is only with continuing improvement in that understanding that science can fulfill its social purpose.

It is the opinion of the Ad Hoc Committee, with regard to "basic" and "applied" research:

1. The first priority for NSF is special and preferential support of basic research and education in science and engineering.
2. Competition for funding between projects directed to immediate national problems and programs of other research, both basic and applied, probably would place the latter at a disadvantage.
3. NSF must be responsive to, and participative in, the engineering, life and social sciences, as bridging mechanisms from the most basic through the most applied.
4. NSF should be responsive to, and participative in, programs to encourage collaborative research of academic and industrial laboratories.

III. It is the opinion of the Ad Hoc Committee that with respect to the functions of the Foundation:

1. Many of the NSF functions described in Section 3 of the Act are best exercised through participation with other Federal departments and agencies. This should be the subject of continuing evaluation and study.
2. The primary responsibility of the Foundation should continue to be support for basic research and science education. This should not be allowed to exclude involvement in applied research and technology utilization.
3. Continued strong support should be given to the means of enhancing applied research and technology utilization.
4. NSF should continue strong efforts to collect information, to attempt synthesis and interpretation, and to advise on policy wherever science is relevant to the general welfare.

IV. The Subcommittee on Science, Research, and Technology has identified 13 principal questions and issues that it expects to consider. The Ad Hoc Committee addresses these as five major topics.

* * * * * * * * * * *

The Ad Hoc Committee intends to continue its deliberations and will forward the results of those deliberations when they are available.

W. N. Hubbard, Jr.

W. N. Hubbard, Jr.
Chairman
Ad Hoc Committee on NSF Act Review

Attachment:
NSB/C-79-82, Revision 3

APPENDIX G

NSF CIRCULAR 107, SUBJECT: PROCESSING RECOMMENDATIONS AND SPECIAL INTEREST ITEMS REQUIRING NATIONAL SCIENCE BOARD APPROVAL OR REVIEW

NATIONAL SCIENCE FOUNDATION
Office of the Director
Washington, D.C. 20550

NSF CIRCULAR NO. 107

(Revision No. 2)

GRANTS AND CONTRACTS

October 1, 1977

Subject: **Processing Recommendations and Special Interest Items Requiring National Science Board Approval or Review**

1. **Purpose.** This Circular sets forth the policy and procedures governing the preparation and review of 1) recommendations for proposed new programs, policies, or awards requiring National Science Board (NSB) approval; and 2) special interest items submitted to the NSB for information purposes.

2. **Cancellation.** This Circular cancels NSF Circular No. 107, Revision No. 1, dated February 8, 1973; O/D 70-20 dated June 22, 1970; O/D 75-57 dated December 19, 1975; O/D 76-7 dated February 6, 1976; O/D 76-20 dated April 2, 1976; and O/D 76-28 dated May 24, 1976.

3. **Requirements.**

a. *Approval Items.* Pursuant to the National Science Foundation Act of 1950 (42 U.S.C. 1864, Sec. 5) and the April 21, 1977 resolution of the NSB, the following must be submitted to the Board for approval (even though the NSF funding action includes monies transferred from other Federal agencies);

(1) Proposed plans for a new program as well as the final program plans;

(2) Proposed awards initiated under any new program, until such time as the Board has authorized application to such program of its general delegation to the Director;

(3) A policy issue that has not previously been resolved by the Board or a proposed change in a policy previously approved by the Board;

(4) Requests for Proposals (RFP's) as well as solicitations and other announcements where awards are expected to require Board approval. These must be submitted to the NSB prior to their release to proposers in accordance with the NSB resolution contained in Agenda Item 6 of the Approved Minutes of the 158th Meeting of the National Science Board (NSB-73-251).

(5) i. A single award commitment of $500,000 or more for a period of 12 consecutive months.

ii. An actual or eventual anticipated total project commitment of $2 million or more.

In determining whether the commitments involved exceed the $2 million cumulative limit or the $500,000 annual limit, following an initial award (any standard grant, continuing grant, cooperative agreement, contract, or other arrangement), every additional award should be added to the initial award if

(a) the successive award is made to the same principal investigator, *and*

(b) the award is based upon the external peer review of the earlier award rather than a new peer review.

Otherwise, each award will be counted separately.

Once the Board has approved a total award commitment of $2 million, Board approval is only necessary when additional funding again reaches $2 million. Awards must be submitted for Board approval under this criterion as soon as program staff *anticipate* that the total ultimately committed is likely to exceed $2 million.

(6) A coordinated program of scientific research composed of a number of individual projects that collectively are expected to exceed the $500,000 annual limit or a total award commitment of $2,000,000.

b. *Special Interest Items.* As requested by the Board, any items considered to be of "special interest" should be submitted to the Board for information purposes. These include:

(1) Any single award of over $400,000 that has not otherwise been submitted to the Board for review.

(2) Any project that has received $1,000,000 or more in NSF support over a 5-year period that has not otherwise been submitted to the Board for review.

(3) Any award that may be considered highly unusual or significant, potentially controversial, or otherwise considered to be of special interest by the staff or the Board.

(4) Special program reports, program reviews, plans or other information requested by either the

assembled Board or NSB Committees for official presentation to the Board.

Numbers (1) and (2) above may be reported to the NSB after the awards have been made; however, judgment and discretion should be used in deciding whether to report items described in (3) above prior to or after the award has been made.

4. **Scheduling.** The NSB Office issues Staff Memoranda entitled "Deadline Dates for National Science Board Meetings" to provide a schedule of due dates for the submission of recommended actions to the Board. Cognizant offices are responsible for the preparation of the necessary documents and the completion of both external peer and internal directorate reviews in time to meet the stated due dates.

As a general rule, the following dates can be used for planning purposes. However, the dates contained in the above-mentioned Memoranda should be consulted for accurate deadlines.

Receipt by the cognizant Assistant Director
Tues. of 7th week before week of Programs Committee meeting
Receipt in the Division of Grants and Contracts (DGC)
Tues. of 6th week before week of Programs Committee meeting
Receipt in Office of Director of items for inclusion on Agenda
Tues. of 5th week before week of Programs Committee meeting
Receipt by Executive Secretary, Director's Action Review Board
Mon. of 4th week before week of Programs Committee meeting
Receipt by Executive Secretary, NSB
Mon. of 3rd week before week of Programs Committee meeting

5. **Procedures for Submitting Proposed New Programs or Policy Recommendations for NSB Approval.**

a. *General.* No press release or other public announcement of a new program should be made until the new program has been specifically approved by the Board. No final action should be taken on grants, contracts, or other arrangements relating to a new program until the Board has given its specific approval to the action or has approved the program and authorized the application to it of the Director's general authority to approve such transactions.

b. *Planning and Coordination.* The office having cognizance for implementation of a new program or policy is responsible for ensuring that the necessary preliminary planning and coordination are completed before the matter is submitted for Board approval. Plans for implementing the new program or policy should be developed in conjunction with interested NSF components and other Federal offices, as appropriate, in order to facilitate obtaining the necessary subsequent concurrences. Coordination within NSF should be accomplished, as necessary, with other Directorates, the Office of the General Counsel, and the Office of Government and Public Programs (GPP) as well as with the appropriate Divisions of the Directorate for Administration.

c. *Preparation and Documentation of Proposed Program Package.* The cognizant office is responsible for preparing the documentation necessary for submitting a new program or policy for Board approval prior to implementation. The following documents are to be prepared:

(1) A Director's transmittal memorandum to the National Science Board, appropriate to the situation, in original and 14 copies, including the following resolution:

> RESOLVED, that the National Science Board approves the __________ Program and the general guidelines for its management as submitted to the Board, and authorizes the initiation of the program.

The transmittal memorandum should contain a complete description of the program or policy, defining its principal thrust and presenting a development of the plans and general guidelines proposed for its management, anticipated annual budget, expected duration of the program, and a list of other programs that will be encompassed or phased out by this new program. If a new program consists of identifiable subelements, these should be identified along with the estimated amounts of funding of each. If the new program is to be supported by funds transferred from other Federal agencies the source and amount should be identified.

(2) NSF Form 10, "Clearance Sheet," and
(3) "NSB Approval Required" tag.

Initial awards then must be submitted to the Board for approval irrespective of the amounts involved. When it is believed that a sufficient number of proposals have been approved by the Board to define the general character of the program, the Board may be requested to authorize the application of the Director's general authorization to approve grants to the new program. The following resolution may be used at this stage:

> RESOLVED, that the Board, having approved the general guidelines for the ________ Program and the general nature of the proposals submitted to the Board, hereby authorizes the application to this Program of the general authority of the Director, under the resolution approved by the Board at its 189th meeting on April 21-22, 1977, to take final action on grants, contracts, or other arrangements without the prior approval of the Board.

d. *Review and Routing Sequence for Proposed Program Transmittal Package.* The transmittal package for a new program or a proposed action requiring policy approval by the Board will be forwarded for review by the initiating office in the sequence outlined below. Upon completion of each review stage, the responsible official will initial NSF Form 10 to indicate concurrence.

(1) *Directorate Review.* Each program transmittal package will be routed for review and approval via the Deputy Assistant Director and the Directorate Action Review Board to the responsible Assistant Director, within the same time frame described in paragraph 4 above. Upon approval by the Assistant Director, a copy of the transmittal memorandum shall be sent to GPP, which may request the program file if it desires more information.

(2) Office of Planning and Resources Management.

(3) Division of Grants and Contracts. (DGC)

(4) Assistant Director for Administration.

(5) The General Counsel.

(6) The Director's Action Review Board (DARB).

(7) The Director.

(8) *NSB Office.* Following the Director's approval the signed original of the proposed program transmittal package is forwarded to the Executive Secretary, NSB, for the assignment of an NSB memorandum number. The entire package will then be sent to DGC.

e. *Processing and Disposition of Proposed Program Transmittal Package Material.* DGC will paginate the transmittal documents, reproduce the required number of copies, and return the originals to the initiating office.

f. *Follow-up to Board Action.* At such time as Board approval is obtained and after the NSB Office has distributed the Board minutes reflecting the action taken, the responsible office will attach a copy of the appropriate portion of these minutes to the Program Office copy of the program package for retention.

6. Procedures for Submitting Proposed Awards Under Previously Approved Programs.

a. *Preparation and Documentation of Proposed Award Package.* The following documents are to be prepared by the responsible Program or Office before a proposed award is forwarded for submission to the Board (other award documents should be prepared after approval):

(1) A Director's transmittal memorandum appropriate to the situation, in original and 14 copies, including a proposed resolution in one of the following formats:

(a) *Single Proposal.*

> RESOLVED, that the National Science Board approves the making by the Director at his discretion of a grant, contract, or other arrangement to (institution) for "*Title*" in an amount not to exceed $________ under the direction of Dr.(s) ________ for ________ year(s).

(b) *Several Proposals.*

> RESOLVED, that the National Science Board approves the making by the Director at his discretion of the following grants, contracts, or other arrangements on the terms set forth below:

Organization	Investigator	Title	Duration	Amount not to Exceed
xx	xx	xx	x yr.	$

The transmittal memorandum also should include the name of the originating Division or Office.

When a proposal is being transmitted for resolution of policy questions, these should be set forth clearly in the memorandum.

(2) For each proposed award, an original and 14 copies of the completed "NSB Approval Package"

(Addendum No. 1) attached to the original and copies of the transmittal memorandum. The Program Award Recommendation section of the "NSB Approval Package" should identify the source and amount of funds transferred from other Federal agencies in support of the proposed project. In those cases where a program will have a large number of similar or identical initial awards, an appropriate sampling of the awards will be prepared and submitted in accordance with the provisions of paragraphs 6.a. and b.

(3) Fourteen (14) copies of each verbatim review received on the proposal with reviewer name, institution, discipline and either the date the review was requested or received. These must be provided to the Executive Secretary of the Programs Committee concurrent with the routing of the NSB case to DGC.

(4) NSB Form 10, "Clearance Sheet," and

(5) "NSB Approval Required" tag.

The applicable program folder should be forwarded as indicated in paragraph 6.b. below, with the related documents enumerated above. The Program folders that accompany the transmittal memorandum should contain reviews of the proposal and otherwise be as complete as practicable.

b. *Review Action and Routing Sequence for Proposed Awards.* Each proposed award prepared for submission to the Board should undergo review in the manner outlined below. Upon completion of each review stage, the responsible official will initial NSF Form 10 to indicate approval. It is the responsibility of each office to see that the proposed award package is provided to the next office in the routing sequence.

(1) *Directorate Review.* Proposed awards will be routed for review and approval via the Deputy Assistant Director and the Directorate Action Review Board to the responsible Assistant Director. Upon approval of a proposed award by the Assistant Director, a copy of the transmittal memorandum and the "NSB Approval Package" shall be sent to GPP, which may request the program file if it desires more information.

(2) *Division of Grants and Contracts.* Directorate action should be completed so that proposed awards reach DGC as soon as possible but, in any event, not later than the date specified in the applicable NSF Staff Memorandum (normally set at 6 weeks prior to the Board Meetings).

(3) *Assistant Director for Administration.*

(4) *General Counsel.*

(5) *Director's Action Review Board.*

(6) *Director.*

(7) *NSB Office.* Following the Director's approval, the signed original of the transmittal memorandum and accompanying documents are forwarded to the Executive Secretary, NSB, for the assignment of an NSB memorandum number. The NSB Office will then send the package to DGC.

c. *Processing and Disposition of Proposed Award Package Material.* DGC will paginate the transmittal documents and reproduce the required number of copies. The originals will be returned to the initiating office along with the proposed award folder and six printed copies of the transmittal documents.

d. *Activation of Board Approved Awards.* After approval by the Board (and at such times as activation is required), the cognizant Program Office will reroute the folder through the normal approval channels (including DGC), in accordance with NSF Circular No. 76 or NSF Circular No. 89, as appropriate, in order that an actual award may be made. The responsible Division Director/Office Head will mark box 16A (NSB Approval) on NSF Form 780, "Recommend and Award Data Form" and initial the appropriate block of NSF Form 67 to indicate Board approval.

e. *Supplements to Board-Approved Awards.* Unless otherwise stated in the specific award resolution, supplements not to exceed 10 percent of the Board approved amount may be made without further Board approval.

7. Procedures for Submitting Special Interest Items to NSB.

a. *Documentation of Special Interest Items.* Special interest items covered by paragraphs 3.b.(1) and 3.b.(2) will be identified by DGC when they are processed for awards. The information required in paragraph 7.a.(2) below will be reproduced from the award jackets and routinely referred to the National Science Board. The cognizant Assistant Director is responsible for ensuring that special interest items specified in 3.b.(3) and 3.b.(4) are forwarded to the Board with the following documentation:

(1) A cover sheet stating the reason(s) a particular item is considered to be of special interest to the NSB. This memorandum should also identify the source and amount of funds transferred from other Federal agencies in support of the proposed project.

(2) For each proposed or actual award, a copy of the Project Summary (Form 4), the Program Award Recommendation (Form 9), the Research Grant Budget Worksheet (Form 1030, or equivalent) and other appropriate information.

(3) A "Special Interest National Science Board" tag.

(4) NSF Form 10 "Clearance Sheet."

b. *Routing Sequence for Special Interest Items Specified in 3.b.(3) and 3.b.(4).* Each special interest item should follow the routing sequence outlined below; each office should indicate its approval by initialing the Form 10.

(1) *Directorate Review.* All special interest items will be routed for review and approval through normal Directorate channels, including the Action Review Board.

(2) *Division of Grants and Contracts.* Directorate action should be completed so that the special interest items reach DGC by the date stated in the monthly Staff Memorandum entitled "Deadline Dates for National Science Board Meetings."

(3) *Assistant Director for Administration.*

(4) *General Counsel.*

(5) *Director's Action Review Board.* Properly documented items should be received by the Executive Secretary of the DARB at least 4 weeks prior to scheduled NSB meetings to permit adequate review and evaluation.

(6) *Director.*

(7) *NSB Office.* Following the Director's approval, the NSB Office will prepare one transmittal memorandum for the Director's signature, covering all special interest items to be reported at the next NSB meeting. The NSB Office will paginate the materials, reproduce the required number of copies.

Richard C. Atkinson

Richard C. Atkinson
Director

APPENDIX H

SELECTED STATEMENTS FROM JUNE LONG-RANGE PLANNING MEETINGS (1975–1980)

SELECTED STATEMENTS FROM JUNE LONG-RANGE PLANNING MEETINGS (1975 to 1980)

Note: Other statements are included as appropriate in other sections of the Appendix.

APPENDIX G

NSB/C-75-15
(Limited
Distribution)

SUMMARY OF DISCUSSIONS AT THE MEETINGS OF TASK FORCE 75-B
June 18-20, 1975

Issue: Are our institutional arrangements for basic and applied research adequate to meet our present and future national needs for science and technology? With respect to university-based research, is there a need for new organizational arrangements which might more effectively meet national needs? Should organizational alternatives to disciplinary-based research within the university be considered?

1. Task Force 75-B devoted the first hour and one-half of its discussion to serving as an advisory group to the staff task force established by the Director (at the recommendation of the Board) to undertake a study of problems affecting the ability of university departments to conduct basic research. A draft questionnaire was reviewed and the extent of coverage of university departments, in the biological and social sciences in particular, was discussed.

2. Task Force 75-B then turned its attention to discussion of alternative institutional arrangements for basic and applied research, beginning with an effort to try to understand the problems that call for alternatives to the presen arrangements. Two major problems were identified: declini enrollments and declining support.

   a. Data indicate that university enrollments are rising at a declining rate and may eventually level off or even decline. Increased participation by groups now underrepresented (minorities and women) would be largely only compensatory and would in any case eventually hit a predictable ceiling.

   Historically, the level of research effort has been closely coupled with overall enrollments in colleges and universities. The primary impact of a steady state of enrollment is upon the size of science faculties and the number of graduate students. The impact of a level graduate student enrollment is threefold:

   (1) The number of potential science teachers becomes a constant,
   (2) The number of scientific investigators levels off, and
   (3) Because of the role of graduate students in research, their contribution to new knowledge becomes a constant.

   Underlying these concerns is the basic assumption, relatively unexamined by the task force at this time, that the Nation needs a steadily increasing level of effort in science. Less sympathetic audiences would examine this assumption vigorously, and more attention must be given to it.

The first problem was thus formulated as that of finding solutions to the problem of decoupling the level of scientific effort in universities from enrollment. Alternatives with some prospect for doing so were sought.

b. The task force also examined data revealing the declining level of support, measured in constant dollars, for research in universities. Therefore, the task force was also seeking alternatives that would maximize the return on current dollars for research.

3. Despite an incomplete understanding of the problem of maintaining a proper level of growth in the basic and applied research effort in universities, the task force turned to discussion of alternative arrangements, in the belief that a thorough discussion of alternatives would increase understanding of the problems.

The list of alternatives was as follows:

a. Increase the concentration of NSF funds into a select number of high performance research universities.

b. Establish or reestablish research institutes in connection with universities. Examples include Lincoln Laboratory (Massachusetts Institute of Technology), Jet Propulsion Laboratory (California Institute of Technology), and Willow Run Laboratory (University of Michigan).

c. Seek means for improving the relationship between universities and Federally sponsored laboratories. This might include merging these laboratories into a structure.

d. Increase the Federal funding of such mechanisms as postdoctoral fellowships, research professorships, and career professorships.

It is recognized that these are not basically new alternatives but with new features--a new rationale that they might earn increased support, or deserve a greater allocation from existing funds. For example, there might be a program of career professorships for scientists, age 55-65, with the understanding that the university would use the released money to hire assistant professors.

e. Increase the use of block funding and/or institutional grants. (The coherent grant mechanism is a subclass of these funding mechanisms.)

f. Develop tax incentives to encourage industry to conduct its basic and applied research in the university context.

g. Reexamine the possibility of profit-making activities in universities.

4. The task force then turned to examination of the first two alternatives in detail.

a. Increased channeling of NSF funds into high performance universities: a research university program.

This idea was examined first for a variety of reasons. It is considered frequently but is rarely pursued in depth, in part for political reasons. In a period of retrenchment (steady state), however, the policy of highly selective allocation of funds to agencies or entities of best performance is one pursued by universities and other institutions. It deserves study by the National Science Foundation.

A special program for high-performance universities (the "inner circle") should have the following properties as a minimum:

(1) The system of initial selection must be fair and equitable. The criteria for selection must be sensible and as objective as possible.

(2) The initial selections must be subjected to credible periodic review.

(3) There must be possibility of moving into (and out of) the inner circle.

(4) There must be incentives for other sources of support (the state, private philanthropy, etc.) to assist in the "moving" process, and there should be disincentives to the withdrawal of support for those in the inner circle.

(5) The entire system of science support must continue to include programs for the support of science outside the inner circle.

(6) The inner circle institution must continue to be heavily dependent on other support programs of NSF, National Institutes of Health, etc.

The discussion of the selection process was incomplete, but there was general agreement that it must rely fundamentally on some index of success in national competition for grants over a period of time for a significant number of faculty members over a significant number of departments.

Even after an institution entered the competition for the select circle, final selection would depend upon the plan developed by the university for the use of an institutional grant. The university and the Foundation would agree on broad categories of use, and considerable direction would be given to the university. The university would be accountable in terms of the standards or goals agreed upon in advance. Periodic reviews (five years) would be conducted.

During discussion, some concerns emerged. First, it was agreed that the research universities program should be designed to avoid the pitfalls of the Science Development Programs. Second, the task force had trouble establishing the unique needs of the probable inner circle universities.

The task force discussed a draft paper prepared by one member on the research universities program. The objective of the proposed program would be:

> To help create, as national assets, the ten greatest science-based research universities in the world.

The point of view of the program would be:

> To build greatness on established strength coupled with proven performance; to provide significantly more funds on a sustained basis to a small and carefully selected group of universities and delegate control and discretion over the use of these funds to the university management.

Methodology for the program and anticipated problems were discussed. The proposed program will be further defined and circulated to task force members for continued consideration in the fall.

b. The second alternative considered in detail by the task force was the establishment (or reestablishment) of research institutes in connection with universities.

In considering means for a partial decoupling of research from graduate education, the single-disciplinary research institute, associated with a university, provides unique advantages. It would permit the strengthening of research at the university without an associated increase in the graduate and undergraduate student body. The close association of a research institute with a university which is already strong in a given discipline or in a group of related disciplines generates advantages for both the institute and the university. The presence of the institute should strengthen the graduate educational function of the university, and the interactions between the two institutions should strengthen the research of both.

The discussion considered types of appointment at such institutes, including problems of comparison with university appointment, and mechanisms for operation of institutes.

A paper describing the proposed research institute idea in detail, its advantages and disadvantages, and exploring the history of certain failures will be prepared and considered further at a subsequent meeting of the task force.

5. Finally, the task force considered briefly an alternative that it felt should be pursued, but not necessarily by this group. It was proposed that a program be designed to facilitate planning for regional university centers in various fields of science at the graduate level. A paper will be prepared describing the problem and steps that the National Science Foundation might take to facilitate solving it.

Mary L. Parramore
Executive Secretary
Task Force 75-B

August 6, 1975

Approved by Task Force Chairman
on July 21, 1975

DRAFT

APPENDIX H

NSB/C-75-16
(Limited
Distribution)

SUMMARY OF DISCUSSIONS AT THE MEETINGS OF TASK FORCE 75-C
June 18-20, 1975

Issue: How successfully have the management structure, philosophy, and practice of the NSF adapted to changes in its scientific, political, and organizational environment? What changes are needed, if any, to improve its ability to respond effectively to this new environment?

Task Force Assignment

Particular attention was to be given to:

1. Peer review and grant award decision-making process;
2. Program planning and priority setting;
3. Public and congressional relations; and
4. Geographic distribution of grants.

Task Force 75-C's assignment was to examine all parts of the above issues and to arrive at a set of views, recommendations, and policy options which the National Science Board might use to reaffirm, modify, or change existing policies and practices on the issues under study.

Background

Early in 1975 the Planning and Policy Committee of the Board identified a number of issues which were candidates for major attention by the Board. Among those which seemed most urgent and timely were the issues selected for Board study at its June 1975 long range planning meeting. The one which was assigned to Task Force 75-C was of especially high priority for a number of reasons: experience of the Federal Government and the academic community with recently strengthened public disclosure laws; desire for more openness in Federal decision making; and, finally, recent criticisms of the Foundation's grant award decision making processes and peer review in particular. The importance of this issue was further emphasized by criticisms sparked by "frivolous" grant titles and "Man: A Course of Study."

Working Papers

The task force was given written descriptions (NSB/C-75-11 included in NSB-75-206) of the various peer review processes used by the Foundation along with a staff paper that summarized the mail review processes and called attention to a number of issues.

Task Force Approach

The task force considered that the peer review component of the issue was of the most immediate concern for the reasons noted above and determined that it would examine the peer review issue in the context of what is best for the Nation and U.S. science in the long term. No attempt would be made to defend any particular process or procedure; the task force would consider each process independently and objectively. Major concerns of the task force were the question of fairness to the principal investigator and a system that would be objective and equitable to all parties.

The task force identified the following six major peer review and evaluation subissues:

1. Confidentiality--The reasons for and against.
2. Selection of peer reviewers--How are they selected and by whom? What criteria are used in the selection process? What are the implications?
3. Internal management control--Are NSF programs and projects subjected to effective independent program audits?
4. Concentration--Are reviewers and grantees concentrated in certain prestigious institutions? Is there a correlation between reviewers and grantee institutions?
5. Feedback--What information is given to successful and unsuccessful proposers or other persons at the institutions? Should more information be provided, including verbatim copies of the peer reviews, verbatim signed copies, etc.?
6. Discrimination power of the process--Is the peer review process really selecting the most meritorious research for support?

Pros and Cons

Task Force 75-C read detailed statements provided by the senior NSF staff on how the various peer review systems work within the Foundation's grant award decision making process. It also listened to a thorough and detailed explanation by the Assistant Director for Research of the decision making process used in the research area with emphasis on peer review. These discussions were buttressed by knowledge provided by task force members and by NSF staff from the Education and Research Applications Directorates.

Some of the major points covered along with the views of the task force follow:

1. Confidentiality

Confidentiality of peer reviewer names and comments is a keystone in the current peer review system, and some persons feel that confidentiality ensures a higher quality of review. Without confidentiality, it is argued that peer reviewers would not be candid in their comments on proposals. Proponents of confidentiality also contend that reviewers might refuse to participate in a system where they are identified with their comments.

Task Force View

In the environment of openness now existing in academia as well as in the Federal Government, the task force feels that it was a particularly opportune time to reconsider the Foundation's practices. The task force believes that U.S. scientists can be relied upon to speak candidly on matters of scientific merit in an open process. Scientists already do it in many areas, and it has not been proven that openness would necessarily result in bland reviews. Evidence shows that some reviewers currently submit reviews that are directed toward personalities and other extraneous factors rather than the substance of the proposal itself. All things considered, Task Force 75-C feels that total openness would best ensure that responsible reviews are provided. Openness would require that the reviewer make a valid and defensible case.

With respect to the allegation that reviewers might refuse to participate, the task force believes that the majority of scientists will participate once they understand the ground rules. While there may be a period of adjustment, there are many reasons why their continued participation can be expected. Thus, in the task force's view, the claim that U.S. scientists cannot be relied upon to speak candidly except in a confidential system or that they might refuse to participate is thought to be more myth than fact. The task force is convinced that, if the system were opened up, it would recalibrate itself and that a higher level of responsibility and validity would result.

2. Workload

Another point made was that, if the system were totally open with reviewers' names provided to principal investigators, NSF program managers might become engaged in lengthy exchanges of correspondence and discussions with disgruntled investigators. It was contended that this would overtax the system with increased workload. It was also suggested that program managers would be required to offer an extensive defense of their decisions.

Task Force View

Task Force 75-C learned that many, if not most, NSF program managers are already required to write a brief rationale for their decisions. The task force view was that such information should be developed and made available to the principal investigator in any case, and that, if verbatim peer reviews are made available to the proposers, the workload should be somewhat reduced because program managers would no longer be required to spend time extracting and paraphrasing reviews.

3. Selection of Reviewers

The present system is based on the premise that program managers are most qualified to determine who the peer reviewer for a project proposal should be. They do this in a number of ways including their personal knowledge, from references contained in the grant proposal itself, from colleagues who have knowledge of capable people in the field, and so on. Program managers are professionally competent and should be trusted to administer their programs objectively.

Task Force View

Task Force 75-C was greatly concerned about the methods used in the selection of peer reviewers. After examining the basis on which peer reviewers are selected, the task force concluded that there is a need to strengthen the selection process. The National Science Board, in the task force's view, should work towards the establishment of criteria for the selection of reviewers to ensure the participation of a broader base of expertise from science institutions in all parts of the Nation.

Task Force 75-C plans to devote more attention to this issue at its September meeting.

4. Program Officer's Responsibility and Authority

It was stated that an open system might diminish the program officer's role and responsibility since he might be expected to follow the consensus of the reviewers' comments.

Task Force View

Task Force 75-C emphasized that it recognized that peer reviews are only one input into the decision making process. The program officers are responsible for making the award decision recommendation based on all relevant considerations including the comments of the peer reviewers, geographic distribution, and other factors. The task force does not believe that the program officer's role would change in an open system.

Public and Congressional Relations and Geographic Distribution

These items are considered unfinished business by Task Force 75-C and will be addressed further at its meeting in September.

Summary

Task Force 75-C concluded that, all things considered, an open society is better than a closed one and that openness in the peer review process is much more consistent with our philosophy of government than is a policy of confidentiality. Although there is likely to be some transient effects on quality because of the changes that would occur in the short term, the system would recalibrate and adjust to the new environment. Further, the task force recognized that for a variety of reasons the move towards openness in the handling of peer reviewers' comments might have to be done on a phased basis.

Task Force 75-C agreed on a resolution reflecting the above views for presentation to the Board.

Syl McNinch, Jr.
Executive Secretary
Task Force 75-C
August 6, 1975

ES:174:38

APPENDIX C

REPORT OF TASK FORCE 76-A
ON NSB/NSF LONG-RANGE PLANNING
AS APPROVED BY THE NATIONAL SCIENCE BOARD
AT ITS 182ND MEETING
June 18, 1976

Issue 76-A

Task Force 76-A addressed the question: How should the policy formulation obligation of the National Science Board be linked with the long-range planning procedures of the National Science Foundation?

Summary of Actions and Recommendations of Task Force 76-A

1. The Task Force considered to be a good idea a staff suggestion for an annual Planning Environment Document (PED). The Task Force recommends six action items to the Board:

   a. The Board should establish and annually update a Planning Environment Document.

   b. The Board should restructure its June meeting to allow for thorough review of the PED and adoption of policy/information guidelines based on this review for action on the fall long-range planning estimates (LRPE) as well as other special analyses.

   c. The Planning and Policy Committee should take responsibility for working with the staff in preparing and presenting the PED at the June Board meeting.

   d. The Committee on Budget should consider reexamining priority considerations, based on the results of the June Board meeting, with immediate priorities integrated into the summer and fall budget preparation and with deferred program priorities integrated into the fall preparation of the LRPE.

   e. An opportunity should be provided during the June Board meeting for the Planning and Policy Committee and the Committee on Budget to meet jointly to review the results of the Board discussion of and actions/guidelines on the PED.

   f. The Programs Committee should consider scheduling its reviews to provide timely information on the status of programs for input to the discussion of the PED at the June Board meeting.

2. In order to provide further guidance to the staff, a more detailed presentation of the structure and type of information to be included in the PED will be developed as an addendum to this report.

3. More deliberate involvement and interaction are desirable between the staff and the Planning and Policy Committee in the preparation of the PED. Such exchanges might be facilitated by a spring retreat involving staff and members of the Planning and Policy Committee.

4. With regard to the responsibility of the National Science Board for formulating and implementing policy, the Task Force recommends that:

   a. The directorates provide the Planning and Policy Committee with a list of the significant policies under which they operate, indicating those having clear NSB guidance and those for which they would like NSB clarification and policy guidance;

b. These lists be reviewed by the Planning and Policy Committee and, where further guidance is required, submitted to the Board with recommendations for action;

c. The Planning and Policy Committee be charged with developing a list of broader policy concerns, such as those identified in "The National Science Foundation--Board and Director" (NSB-76-199, prepared by Mr. William J. Hoff, former NSF General Counsel), for possible NSB comment and action;

d. The results of these activities and NSB actions be appropriately listed and indexed in a Policy Compendium for periodic review and updating by the National Science Board.

APPENDIX B

June 24, 1977

REPORT OF TASK FORCE 77-A

Status of Science

Task Force A considered the material produced to review the status of science as perceived by NSF staff. The Task Force generally approved of the effort and found the information to be useful to the Board in providing a coherent overview of the assumptions underlying NSF long-range planning.

1. It is recommended that the status of science section be produced annually as background material for June Board meetings.

2. It is further recommended that information in future reviews be improved according to the instructions listed in Attachment I.

3. It is also recommended that the production and use of this review be coordinated by NSF staff to complement and fit into the schedule of long-range planning and budgeting of the Foundation.

The purpose of the status of science reviews is to provide the contextual background of assumptions surrounding the long-range budget planning of the Foundation. Generally, the substantive material on the directions of the fields of science should emphasize the excitement of research, current and potential, in these fields.

1. In doing so, it should also emphasize reasons of timeliness in certain special research opportunities; and the facilities, instrumentation, or special funding efforts required to encourage the pursuit of these.

2. It should also estimate and emphasize the flexibility in budgetary planning to be responsive to new directions in the fields of science (as these may arise, perceived from within the scientific community).

3. Where current and potential developments in a field can be seen as having extrinsic importance outside the field, such important relationships should be noted.

In reviewing the status of science material this June, the Task Force also identified several important issue areas which should be considered for review by the Board next June. Attachment II lists these areas, along with the issues carried over from this last year.

It is recommended that these issues be considered by the Planning and Policy Committee as possible candidate issues for the next planning environment review in 1977-1978. 193:27

Attachment I

REPORT OF TASK FORCE 77-A

Improvement and Additions to Status of Science Reviews Updates as Appendices for Future June Meetings

(Trend data wherever possible instead of tables)

1. General purpose in summaries (and appendices to summaries) is to identify the excitement of current research as well as future science opportunities.
    a. Expand discussion of research opportunities.
    b. Include key material from advisory oversight committee reports.
2. Improve discussion of facilities and instrumentation needs.
3. Show Materials Research Laboratories and similar laboratory and center support as separate from general project support by location, level of support and specialization, number of years of support provided, and present length of commitment.
4. Show young investigator support as separate from support provided established investigators.
5. Articulate inflationary impacts, where possible.
6. Improve description of other Federal agencies' directions and levels of support in each field, where possible.
7. Add industrial directions and levels of support in each field, where possible.
8. Improve time trends on career data on Ph.D.'s (enrollment, production, employment, tenure, and movement).
9. Articulate present and potentially exciting relations between disciplines or fields.
10. Improve the information about fund flexibility.
11. Include international context descriptions, where missing. Write-ups should include cooperative as well as competitive relationships.
12. An example or case study per division is desirable where excitement or issues can be thus expressed or illustrated.
13. In addition to the above improvements, it is recommended that a science policy environment review be prepared which includes more than the Federal institutional context. It should include:
    a. Substantive policy areas (e.g., energy policy),
    b. State and local governments, 193:28
    c. Industrial policy.

Attachment II

REPORT OF TASK FORCE 77-A

Future Policy Issues

I. Institutional Issues

A. Examine the ability of universities to maintain research capabilities.

1. Reduction of paperwork by grantees (accountability impeding innovation).

2. Overhead costs.

3. Manpower problems and alternative strategies (e.g., institutes, leaves, career change).

4. Interactions between other sources of support and functions (e.g., industrial support, educational support, state support, etc.).

5. Focus support on a limited number of universities.

B. Shared research facilities.

1. Where do these exist and future opportunities?

2. Preservation and consolidation of older collections.

3. Management problems of participation and renewal.

C. Inter-institutional cooperation among government, industry and universities.

II. NSF role in industrial basic research (incentives and disincentives).

III. NSF role in assisting state and local governments' research needs.

IV. Management of NSF at two billion dollar level.

V. Further crosscut studies, e.g., renewable resources.

VI. Appropriate roles of NSF in international science.

193:29

APPENDIX C

June 1977

REPORT OF TASK FORCE 77-B

Patterns of Decision-Making for Science

The major points listed below were made during the deliberations of Task Force 77-B. They were seen as general observations and suggestions pertaining to the impending implementation of the Zero Base Budgeting (ZBB) format for budgetary decision-making.

1. The original concern of Task Force 77-B was to study the degree to which scientific priorities are being set from outside the scientific community.

2. A set of case studies of decision-making in NSF was developed to illustrate a range of instances of priorities deriving from inside (bottom up) and outside (top down) the scientific community.

3. The Task Force chose to set its discussion in the context of the ZBB decision format. It utilized the case materials to examine how the variety of influences in the total play of decision-making fits the framework of ZBB.

4. For purposes of discussion the decision units involving the programs, divisions, and directorates are defined as "bottom up". The ranking criteria used by the Director are considered to be "top down".

5. It is suggested that the ranking criteria for these decision units should be developed and made specific for review and comment by the Directorate Advisory Committees. The objective is to obtain review and advice in support of developing valid ranking criteria from the Advisory Committees.

6. The committees of the Board (Executive, Programs, and Budget) should include in the ordinary conduct of their business, Board policy concerns related to the establishment of objectives and description of ranking criteria. The NSB as a whole, therefore, does not need to establish any new mechanism for the implementation of ZBB.

7. The Executive Committee should set forth for the Board the ranking criteria that have been used so that they can be endorsed by the Board.

8. The set of ranking criteria used by the Director should be comprehensive so as to represent all of the various mandates and demands upon NSF.

9. The long list of specific criteria that will be developed should be subsumed under a small number of comprehensive headings. The Task Force discussed several such headings, but concluded that a more extensive search by staff was necessary.

10. The Board should review the Director's proposed ZBB budget to the Office of Management and Budget.

11. The Task Force understands that not all of its suggestions will be able to be implemented this year due to severe time constraints.

12. In conclusion, it was the view of the Task Force that the many criteria that properly influence the allocation of resources to science will be clearly revealed through the process of Zero Base Budgeting.

APPENDIX D

REPORT OF TASK FORCE 77-C

Historically, the primary constituency of the National Science Foundation has been, and continues to be, academic and other scientists and engineers, because these are the principal performers of research and science education. However, the Foundation has had a variety of interactions with other constituencies, and the Task Force recognizes the need for even broader involvement with society and its various publics. Therefore, the Task Force recommends that:

1. The National Science Board welcome the appointment of "nonscience or public" Members to the Board based on the following criteria: the nominees should be persons eminent and knowledgeable in public affairs, who have not been practicing scientists, but who have demonstrated involvement or interest in science and technology.

2. The National Science Board establish a Board committee on science and society to monitor and make recommendations with respect to Foundation programs and activities, existing and proposed, as they relate to the interface between science and society. Pursuant to this recommendation, the following three items are considered primary:

    a. A review of the Foundation's public information mechanisms and processes oriented to the general public regarding developments in science.

b. A consideration of whether the Foundation has available to it a systematic, regularized means of determining the perceptions and needs of existing and potential constituencies, and to make appropriate recommendations.

c. A cataloging, description, and assessment of the involvement of nonscience publics in NSF's programs and activities, both formal and informal.

June 24, 1977

FINAL REPORTS OF TASK FORCES

a. Task Force 78-A

Dr. Hubbard, Chairman, presented the report of Task Force 78-A which recommended that two statements be developed: (1) of agency purpose and responsibility which embodies the exclusive franchise of the NSF within the Federal Government to foster and support research creativity and training in the Nation; and (2) of agency goals understandable to OMB, the Congress, and the public for use by NSF in the budgetary/decision process.

199:14

The Task Force proposed the following general statements of the NSF objective:

> The fundamental purpose of the National Science Foundation is to benefit the general welfare by fostering and sustaining the capacity for creativity in both the pursuit of scientific understanding and the generation of new scientists.
>
> This fundamental purpose is enabled by:
>
> (1) Supporting basic research in the physical, mathematical, engineering, biological, social, and other scientific disciplines;
>
> (2) Supporting selected applied research that links and develops knowledge in ways that enhance its usefulness;
>
> (3) Providing the supporting services and encouraging the institutional forms that facilitate the above functions; and
>
> (4) Supporting selected activities to improve the understanding of science and its use by all students and the public.
>
> The goals of the National Science Foundation are as follows:
>
> (1) To pursue the highest quality in the Nation's research capability;
>
> (2) To foster greater returns to society of the national investment in research;

(3) To provide information regarding national scientific and technological capabilities; and

(4) To improve the effectiveness and responsiveness of the National Science Foundation.

At the conclusion of the presentation, and after a brief discussion, the Board Chairman called for a vote to accept the report in principle. The Board then took the following action:

199:15

NSB/Res-78-72 The Board unanimously AGREED to accept in principle the general statement of objectives and goals proposed by Task Force 78-A with the understanding that the Foundation's staff will edit this statement prior to a formal acceptance of the statement by the Board.

b. Task Force 78-C

Dr. Bisplinghoff, Chairman, presented the report of Task Force 78-C which included a commendation to the staff on the Status of Science document and suggested that the staff:

(1) Properly qualify the Status of Science document to indicate its restrictive nature and its use for internal planning purposes only;

(2) Make certain improvements in the document, including the incorporation of a Science Education section; and

(3) Continue and expand the analysis of NSF commitments, as presented on page C-5 of Volume III.

The Task Force also offered two recommendations for the Board's consideration:

(1) That the Board and staff review the present procedures for considering major budget items having open-ended large commitments with the view of early warning and better control of such long-term financial commitments; and

(2) That the Board encourage the authors of the special papers in Volume I, among whom are Shapley and Phillips, Manners and Nason, Kidd, and Mosher, to publish their papers in the open literature, such as Science, with appropriate reference to NSB/NSF.

At the conclusion of Dr. Bisplinghoff's presentation, and at the request of the Board Chairman, the Board took the following action:

NSB/Res-78-73 The Board unanimously AGREED to receive the report of Task Force 78-C.

The Board then acted on recommendation (1) as follows:

NSB/Res-78-74 The Board unanimously APPROVED the recommendation of Task Force 78-C that a review be carried out of the present procedures within the National Science Foundation for considering major budget items having open-ended large commitments with the view of early warning and better control of such long-term financial commitments.

Board action on recommendation (2) was as follows:

NSB/Res-78-75 The Board unanimously APPROVED the recommendation of Task Force 78-C that the National Science Board encourage the authors of the special papers in Volume I of the Planning Environment Review document, among whom are Mr. Willis H. Shapley and Mr. Don I. Phillips, Mr. George E. Manners, Jr., and Mr. Howard K. Nason, Mr. Charles V. Kidd, and The Honorable Charles A. Mosher, to publish their papers in the open literature, such as *Science*, with appropriate reference to the National Science Board and the National Science Foundation.

The final report of Task Force 78-C is attached as Appendix C.

c. Task Force 78-B

Dr. Cobb, Chairman, presented the report from Task Force 78-B which is summarized below. The Board received the report and agreed that it should be referred to the Planning and Policy Committee for expeditious consideration.

The Task Force reviewed the context of NSF programs relevant to the LDC's and found a need and desire for an expansion of effort in this area. The Task Force recommended that: (1) NSF undertake substantially enlarged programs of cooperative research in areas of interest both to the U.S. and to the LDC's; (2) NSF undertake a broad range of programs to help build scientific infrastructure in the LDC's; (3) NSF undertake additional studies of the role of science and technology in the development process; (4) the Director seek the resources necessary for NSF to take a leading role in this area.

In making her report, Dr. Cobb cited several general philosophical recommendations from the Task Force: (1) the focus of the programs under consideration should be for time periods measured in decades; (2) short-term political considerations should be avoided; (3) the private sector should be involved in the areas where it can make a contribution; and (4) because regional efforts may often allow a multiplier effect, they are to be preferred over single country efforts, other things being equal.

In the discussion which followed Dr. Cobb's presentation, Dr. Hueg again reiterated his earlier suggestion that the Foundation consider the opportunities afforded by Title XII of the Foreign Assistance Act, P.L. 94-161, in connection with any LDC effort.

It was urged that the Foundation take the initiative in this area with the Congress and the White House without delay.

Dr. Mac Lane expressed doubts about the multiplier effect of regional efforts. This was responded to by several historical examples of the success of such efforts. Although the recommendations of the Task Force encompassed a broad range of programs, the consensus was that the Foundation should take the initiative and volunteer to undertake those programs to which it can make an important national contribution.

At the suggestion of the Chairman, the Board took the following action:

NSB/Res-78-76	The Board unanimously AGREED to receive the report of Task Force 78-B with the understanding that the Chairman will refer it to the Planning and Policy Committee for expeditious consideration and action.

Dr. Cobb expressed her appreciation to the Task Force members, to the NSF staff, and particularly to Dr. Shinn, for their assistance.

The final report of Task Force 78-B is attached as Appendix A.

AGENDA ITEM 6: OTHER BUSINESS

a. Appreciation to Hosts

Dr. Mac Lane proposed a resolution of appreciation to the NCAR for hosting the 199th Board Meeting.

NSB/Res-78-77/A	The Board unanimously ADOPTED a resolution thanking the National Center for Atmospheric Research for hosting the 199th Meeting of the National Science Board, attached as Appendix B.

b. Reception

On Thursday evening the Board hosted a reception for UCAR Trustees, NCAR staff, and local dignitaries on the Tree Plaza at NCAR.

Jane Orr

Jane Orr
Assistant Executive Secretary
National Science Board

Attachments:
- Appendix A--Task Force 78-B Report (NSB-78-310)
- Appendix B--Resolution of Appreciation to NCAR
- Appendix C--Task Force 78-C Report

APPENDIX A
(Attached to
NSB-78-294)

NSB-78-310

REPORT OF TASK FORCE 78-B
The NSF Role in Science and Technology in the Developing Countries

As Received by the National Science Board at its
199th Meeting on June 16, 1978

Objectives: To consider policy options and designs for potential National Science Foundation (NSF) programs of scientific cooperation with the lesser developed countries (LDC's).

Findings: Task Force 78-B reviewed the context of NSF planning with respect to science and technology in the LDC's and found:

A. Clear evidence of Administration and Congressional interest in greater use of science and technology in development efforts.

   1. PRM 33 will set overall science and technology policy in this area. All research and development (R&D) agencies will be involved. Support for both research and infrastructure development is expected to be endorsed.

   2. A new Science and Technology for Development Foundation (STDF) is being proposed within a rebuilt Agency for International Development (AID). It will have a broad mandate.

   3. A larger coordinating role in the science and technology (S&T) area is expected to be given the Department of State in pending legislation. NSF can expect requests to assist in this function.

B. Other countries, both developed and less developed, clearly want a larger U.S. role in cooperative research, infrastructure development generally, and especially science policy development.

   1. The Saudi Arabian program is an example.

   2. Interest of Greece and Israel expressed to Dr. Harvey Averch on recent trip.

   3. United Nations Conference on Science and Technology for Development (UNCSTD) derives mainly from such interest.

   4. There is much interest in existing bilaterals.

C. NSF has the capability to develop strong programs in cooperative research and infrastructure building. It is recognized that additional staff and funding will be necessary, but NSF knows how to do both tasks well. All that is necessary are the resources and the commitment to do it.

D. The level of effort in existing NSF programs in the international area is inadequate to meet the expressed interest and need.

Recommendations:

Task Force 78-B considered these findings, and the options discussed in the staff paper prepared for Issue B, and recommends the following:

A. NSF should undertake substantially enlarged programs of cooperative research with LDC's. These programs in general would have the following characteristics:

   1. They would be genuinely cooperative efforts, involving both scientists and governments of the LDC's.

   2. They would result, more often than not, from LDC initiatives.

   3. They would be problem oriented, and deal with problems of interest to individual LDC's or regional groupings.

   4. They would usually be applied in nature, although basic research in areas of problem relevance would also be undertaken.

   5. They would be interdisciplinary, and would be more like those in the Directorate for Applied Science and Research Applications than like those in the Research Directorates.

B. NSF should undertake, in response to LDC initiative, a broad range of activities generally aimed at building better scientific infrastructure in the LDC's.

   1. Examples of appropriate activities include:

      a. Improving and facilitating the education of LDC students in the U.S.

      b. Providing short courses in areas such as science information, computer applications, science policy and management, or instrumentation, in order to make training received in the U.S. more relevant to LDC environment

      c. Faculty exchange programs

      d. Advice and help in developing science and technology education and research institutions in LDC's

      e. Precollege curriculum development and teacher training

      f. Development of science information systems

      g. Science policy assistance

      h. Development of peer review systems for S&T projects

      i. Development of needs assessment procedures.

2. Infrastructure building requires an understanding of the culture of the LDC. NSF will need to seek help from non-scientists in AID, Department of State, academia, or other places which can assist in transplanting scientific ideas and concepts to non-Western settings.

3. Both the Directorates for Scientific, Technological, and International Affairs and Science Education have considerable experience in these areas which can be drawn upon in developing these programs.

C. NSF should undertake a program of studies focused specifically on the role which S&T can play in economic development. As this process becomes better understood, the programs of research and infrastructure development should evolve accordingly.

D. A compendium of past successes in projects dealing with the LDC's should be assembled, in order to serve as a basis for further planning.

E. In view of the developing national interest in this area, the Director is urged to request additional resources, in terms of both funding and staff, to allow NSF to undertake a leading role in developing the necessary programs. Discussions with both the Administration and the Congress should seek sufficient resources to allow effective programs to be developed and executed in a timely manner.

Other Considerations:

A. Several general philosophical considerations are:

1. The focus should be resolutely fixed on long-term payoffs. Time periods measured in decades will be necessary. Promises of short-term gains should be avoided.

2. Short-term political considerations should be avoided as much as possible. The focus in long-term results requires sustained efforts over time, and cannot be maintained if fluctuations in diplomatic relations are allowed to dominate. We must seek to build a scientific community, based as fully as possible on scientific considerations in the LDC's.

3. Many things can be done best by the private sector, and should be left to it. Specifically, NSF should avoid involvement directly in transfer of commercial or industrial technology.

4. Regional efforts may often allow a multiplier effect, and are to be preferred over single country efforts, other things equal.

B. Finally, it should be recognized that the distinction between supporting research and supporting infrastructure is conceptual. In practice, many projects and most programs should serve both major goals in some degree, even though oriented primarily towards one or the other.

Prepared by Dr. Allen M. Shinn, Jr.
Executive Secretary, Task Force 78-B

Approved by Dr. Jewell P. Cobb,
Chairman, Task Force 78-B

July 24, 1978

APPENDIX C
(Attached to
NSB-78-294)

NSB-78-329

Report of

Task Force 78-C

NSB Long Range Planning Meeting

June 14-16, 1978

Item Reviewed: I. Status of Science Reviews
II. Flexibility Analysis
III. Status of Science Education Review

Status of Science Reviews (Volume II)

1. Staff should be complimented on Status of Science Reviews, and for achieving a higher degree of perfection upon already considerable refinement.

2. Better external labeling is required to show the restrictive nature of the document--preferably on the cover.

   In general, the Committee wishes to ensure that the document is qualified so as to make perfectly clear to the reader that the document is restrictive in character applying only to NSF Programs as an internal planning document.

3. New thrusts and opportunities should be qualified as referring only, for example, to chemistry as it is embraced by the Division of Chemistry in NSF and as they are perceived by the NSF staff. In addition, it should be pointed out that Chemistry is also funded by other Divisions such as Materials, etc. Similar comments may be made about other Divisions and we ask the staff to reexamine the whole document with this in mind.

4. The Task Force would like to see the manpower section illustrate what fraction NSF is contributing to total faculty support.

5. The Task Force recommends that the papers in Volume I be published in the open literature by their authors.

Flexibility Analysis (Volume III)

Degree of Freedom Analysis--NSF Program Dynamics

1. This kind of analysis is considered important by the Committee and should be pursued and perfected.

2. A greater analysis in depth of major items should be made in terms of:

   (a) Construction costs
   (b) Operating costs
   (c) Costs of supporting users

3. More thought should be given to the use that will be made of the flexibility analysis as a management tool. The data that should be compiled depends to a considerable extent on the management decisions that are to be made.

4. The committee believes that there are three levels of aggregation of flexibility analyses:

   (a) National level
   (b) NSF wide or Board level
   (c) Division or discipline level

5. Table on pg. C-5 gives a rough picture of the state of affairs as they exist at the present time. The Committee wishes to emphasize the importance of trends in these data. If possible, it is hoped that it will be possible to work backwards in time to develop trends.

6. In the Table on pg. C-5 under New Starts, it would be desirable to indicate what fraction involves new investigators.

7. In the Table on pg. C-5, it would be desirable to include trends in success ratios.

8. An estimate of continuing grant commitments in future years would be desirable.

9. The Committee suggests that the staff look at the possibility of differentiating trends in externally mandated items from internally mandated.

10. The Committee would like to see an estimate of what NSF resources are required to automate and obtain analysis and trends on flexibility.

11. Task Group C recommends that a review be carried out of Board and staff procedures for approving major items and making open-ended commitments. We understand that NSF staff is commencing a review. Board should follow their activities and develop its procedures to work in concert. For example, the Board would like to have early warning of significant major items and track them through their development.

Task Force C--Materials for Status of Science Education

1. Description of the research community in research on science learning. Strategies for building upon this base.

2. Sharpen up distinction between description of NSF's science education role and the whole system of science education.

3. Some attention to the role of other federal agencies in science education and points of coordination (NIE, NIH).

4. Attention to measures of outputs of science education.

5. Attention to data relevant to the role of NSF programs in producing "elite" scientists, versus the role of increasing science literacy among broad population groups.

6. Develop data on each Science Education program along the lines sketched out for the 5 programs. (Vol. III pp. C-SE-14-18).

   Include for each program, material on:

   - Purposes
   - Target group characteristics
   - Performer characteristics including participation rates in proposals and awards
   - Percent of target group reached and/or other impact data.

Prepared by Dr. Fred Betz
and Dr. Carlos Kruytbosch
Approved by Dr. Bisplinghoff,
Chairman, Task Force 78-C
July 26, 1978

199:28

APPENDIX B
(Attached to
NSB-78-490)

NSB-78-493

REPORT OF TASK FORCE 78-A

NSF and Support of Research and Science Education in the 1980's

as adopted by the National Science Board at its
202nd Meeting on November 16-17, 1978

AGENCY MISSION

The fundamental purpose of the National Science Foundation is to benefit the general welfare by fostering creativity in the pursuit of basic scientific understanding.

This fundamental purpose is enabled by support of:

1. Basic research in the physical, mathematical, biological, social, and other sciences and in engineering;

2. Science education and training to develop new scientific talent;

3. Applied research that links and develops knowledge in ways that enhance its usefulness;

4. Selected activities to improve the understanding of science and its use by all students and by the public;

5. Research resources (facilities) and institutional forms required in the conduct of research.

AGENCY GOALS

The goals of the National Science Foundation are to:

1. SUPPORT RESEARCH on (a) fundamental laws of nature, (b) man and his natural and social environment, and (c) technology-oriented sciences.
    - Provide SUPPORT to the highest quality researchers in areas with significant potential for advancing scientific understanding.
    - Provide RESEARCH RESOURCES AND EQUIPMENT demanded in the conduct of science.
    - Foster EDUCATION AND TRAINING to maintain U.S. scientific leadership in future generations.
2. ENHANCE RETURNS FROM NATIONAL INVESTMENT IN BASIC RESEARCH.
    - Encourage development in those areas of science with EXCEPTIONAL PROMISE for contributing to resolution of significant problems.
    - Foster greater COOPERATION within national and international communities.
3. IDENTIFY AND RECOMMEND NATIONAL POLICIES DESIGNED TO ENHANCE THE HEALTH AND VIGOR OF THE NATION'S SCIENTIFIC ENTERPRISE.
    - Provide INFORMATION AND ANALYSIS regarding national Science and Technology capabilities.
    - Recommend POLICIES designed to maintain a strong national research capacity.
4. MAINTAIN AND IMPROVE AGENCY EFFECTIVENESS AND RESPONSIVENESS.
    - Encourage EQUAL OPPORTUNITY for participation in science.
    - Foster greater PUBLIC UNDERSTANDING of science and the impact of science on public policy issues.
    - Improve AGENCY MANAGEMENT and ACCOUNTABILITY.

AGENDA ITEM 13: FINAL REPORTS OF DISCUSSION GROUPS

a. Discussion Group 79-A--Support of Young Researchers/Young Investigators (Dr. Mac Lane and Dr. Rich, Co-Chairmen, Dr. Cobb, Dr. Cota-Robles, Dr. Ragone, Dr. Salpeter, and Dr. Shields)

The Board received and noted the report of Discussion Group 79-A which recommended that the staff consider two proposed courses of action for the support of young researchers/young investigators. Both plans would be designed to impact upon departments which are now overly staffed with tenured appointments and in which openings are not expected to be available until the late 1980's or early 1990's. The two plans are as follows:

(1) The first proposed program would provide grants to individual young investigators, who might not yet be at an institution, to cover 50 percent of their salary support for four years, competitively renewable once. The objectives of this approach would be to assist a young investigator to find a position within a university department and/or to enrich the career opportunities of an individual already in a department.

(2) The second proposed program would provide grants for individual young investigators who already have tenure-track positions. The research proposal to the Foundation would originate jointly from a department and a young person, probably within seven years of receipt of a doctoral degree.

The award would be for an amount approximately equivalent to the full-time salary of the applicant. The duration would be for four years, competitively renewable once. As a condition of the award, the institution would agree to add a new assistant professor in the department on a tenure-track appointment and would agree to retain this individual for the duration of the award. One-half of the award would pay one-half of the salary of the initial applicant and the other half of the award would be applied on the salary of the new assistant professor. The net effect of this plan is to create more faculty/research positions. Support of one young investigator already in a department would provide an opportunity for an additional young investigator to be hired.

Another plan involving the support of senior scientists that would allow the creation of new assistant professor positions was also considered. Although several positive characteristics were discussed, it was felt that plan (2) above probably provided the most direct benefits and that only one plan should be promoted currently.

b. Discussion Group 79-B--Review of NSF Organic Act (Dr. Hubbard, Chairman, Dr. Bisplinghoff, 1/ Dr. Branscomb, 1/ Dr. Koshland, Dr. Massey, 2/ Dr. Rice, and Dr. Zumberge)

The Board received and noted the report of Discussion Group 79-B, which the Board Chairman later referred to the Ad Hoc Committee on NSF Act Review for further consideration. The report contained the following recommendations concerning the review of the NSF Organic Act:

(1) NSB Science Policy Reports

The Discussion Group confirmed the importance of the annual reports of the Board. The Group suggested less direct involvement of the Board in the science indicator reports and urged the establishment of a staff for the special reports of the Board (as for science indicators). It recommended that no change be made in the Act at the present time.

(2) Composition of NSB Membership

The report endorsed the June 1977 policy statement of the Board affirming the inclusion on the Board of individuals eminent and knowledgeable in public affairs who have demonstrated involvement and interest in science and technology. It was noted that science faculty from four-year colleges have provided distinguished NSB Members and this source of nominees should be kept prominently in mind. The report recommended that the present nomination system be continued. No change in the Act was recommended.

1/Unable to attend Discussion Group meetings on June 20-22.
2/Unable to attend Discussion Group meetings on June 20-21.

(3) NSF Role in Federal Support of Scientific Research

The report endorsed the Board's mission and goals policy statement of January 1979, "NSF and Support of Research and Science Education in the 1980's," and agreed that, while the Foundation should be responsive to changing needs and opportunities in science, its multiple responsibilities should not obscure its central responsibility for basic research in particular and the health of science generally. NSF support should be of consequence in each major scientific discipline. No changes in the Act were recommended.

(4) NSF's Role in Applied Research Support, University-Industry Coupling of Research, Moving from Scientific Discovery to Dissemination

The report indicated that NSF's authority in these areas appears to be adequate, and no changes in the Act were recommended. The report stated, however, that there should be strengthened university-industry support in the interface between basic and applied research. The Discussion Group took cognizance of the distinctions historically applied to the basic-applied discussion and indicated a need for clarification of whether the interface occurs along a continuum or between completely separate entities. This understanding is needed to clarify the nature of the transition from fundamental understanding to utilization of knowledge. Further, specific actions are desirable in funding the applied research area, especially in exploratory and "gap-filling" activities, to show good faith in carrying out present NSF responsibilities. Concerns seem inevitable if increases in applied research programs appear to affect basic research growth.

(5) Increase in Board's Flexibility to Delegate to the Director

The report questioned whether the present dollar specifications in the Act are currently appropriate. It speculated that a more broadly stated delegation of authority to the Director might increase the Board's capabilities to exercise various forms of oversight and also suggested the workload of the Programs Committee might be reduced by giving additional attention to procedural improvements.

The question of a change in the Act was left open, and Board Members were requested to submit any suggestions they might have on this subject.

(6) Continuation of Terms of NSB Members

The Discussion Group considered several alternatives: (a) to extend the terms of service for Board Members until their successors are duly appointed, and (b) to change the effective date of the six-year term of office of Board Members to increase the likelihood of a full Board at all times for critical budget planning and grant approval during the summer and fall, while still enabling retiring Members to better plan their future schedules. The question of a change in the Act was left open.

(7) NSF Position Options Concerning the Proposed Institute for Scientific and Technical Cooperation (ISTC)

The Board in November 1978 stated an affirmative position on the development of indigenous scientific competency in less developed countries. The report recommended that NSF retain its full discretionary powers by placing its emphasis on scientific competency and attempt to keep foreign policy questions or ISTC management matters from unduly involving NSF. No changes in the Act were recommended.

(8) Number of Alan T. Waterman Awards Annually

The report recommended no change with respect to the Alan T. waterman Awards, but suggested consideration of changes in internal procedures, including those governing the age limit and of honorable mention awards.

(9) Number and Level of Presidentially Appointed Assistant Directors

The report recommended two possible changes in the Act regarding the number and level of NSF Presidential appointees. The advantages for recruitment of senior professional staff (which was among the purposes the amendments to the NSF Act in 1968 were intended to achieve) have largely been overtaken by changes in Government salary provisions. Thus, the report recommended either: (a) the elimination of the requirement for Presidential nomination and Senate confirmation of Assistant Directors; or (b) the increase from four to six in the number of Presidentially appointed Assistant Directors and an increase in salary from level V to level IV. The Ad Hoc Committee on NSF Act Review will study these alternatives and report back to the Board.

(10) Excepted Appointment Authority

The report recommended that there be no change in the Act with respect to the NSF Director's authority to make excepted appointments, in accordance with Board policies. It was felt that experience is needed to test the adequacy of this authority as amended by recent legislation and to evaluate its effect on NSF capabilities to carry out its mission.

c. Discussion Group 79-C--Adequacy of Funding Mechanisms (Dr. Cooke and Mr. Doan, Co-Chairmen, Dr. Friedl, Dr. Hogness, Dr. Hueg, Dr. Kasha, Dr. Pettit, and Dr. Slichter 1/)

The Board received and noted the report of Discussion Group 79-C which is intended to provide Board guidance to Foundation staff as it develops a response to the request of the House Committee on Science and Technology for new ideas concerning funding and organization of NSF research support.

The report covered the following issues:

(1) Factors Believed to Inhibit Creativity and Risk-taking in Science and the Need to Support Such Research

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1/Unable to attend the Discussion Group meetings on June 20-22.

The Discussion Group favored examination of two possible mechanisms: (a) evaluation of proposals without regard to track record; and (b) awards based entirely on recent track records, either solicited or unsolicited. The report recommended that NSF Divisions should be encouraged to design mechanisms such as suggested above to increase support of creative high-risk science projects.

(2) Overhead

The Discussion Group had no recommendation for the resolution of the continuing problem of overhead expense.

(3) Master Grant Concept

The report encouraged the Foundation to continue its experiment with the administrative concept of Master Grants.

(4) Block Grants

The report recommended that the exploration and expansion of this concept be referred to the Ad Hoc Committee on Big and Little Science for further consideration.

(5) Three- to Five-Year Grants

Lengthening the period of grants was considered by the Discussion Group. One plan, called the "Pimentel Process," proposed that a certain percentage of three-year proposals, deemed of exceptionally high quality, be offered support for another two to three years at the same funding rate without further peer review. This concept would offer two advantages. It would require less paperwork from the principal investigator and so permit more time for research. The Foundation staff, having made the initial judgment that the research was outstanding, would also be relieved of additional paperwork.

A motion proposed by Dr. Rich to approve the implementation of this concept of a continuing grant was tabled for development of background by the staff and subsequent discussion at the August Board meeting.

(6) Variation in Peer Review Practices

The report recommended that there be continuing Foundation-wide study of the effectiveness of peer review practices in terms of NSF efficiency and effectiveness in selecting the best projects.

(7) Five-Year Rolling Grants

The report did not recommend that the concept of five-year rolling grants, a process utilized by the Agency for International Development, be adapted for Foundation use.

The Discussion Group recommended consideration of formula awards to institutions as a means to stimulate new research by new scientists in fields that may experience difficulty in getting established, and matching grants such as are now underway in the university-industry and research equipment programs.

The Discussion Group also proposed that the Ad Hoc Committee on Big and Little Science give further consideration to (a) new methods of financing research equipment through loans, venture capital investments, bonds, and other means, and (b) mechanisms for making very small grants primarily to scientists at small, four-year colleges.

After receiving the reports of the three Discussion Groups, the Board Chairman asked the staff to study and evaluate the various suggestions and recommendations from Discussion Groups A and C. He requested the Ad Hoc Committee on NSF Act Review to consider the recommendations of Discussion Group B.

The meeting was recessed at 12:00 noon.

The Board met in Closed Session from 12:00 noon to 12:15 p.m.

Jane Orr
Jane Orr
Assistant Executive Secretary
National Science Board

Attachments:
- Appendix A--Resolution of Appreciation to Hosts
- Appendix B--Resolution of Commendation to Dr. Krumhansl
- Appendix C--Resolution of Commendation to Dr. Slaughter
- Appendix D--Final Report of Discussion Group 79-A
- Appendix E--Final Report of Discussion Group 79-B
- Appendix F--Final Report of Discussion Group 79-C

207:23

APPENDIX E
(Attached to
NSB-80-289)

Report of Discussion Group 80-B

The Development and Maintenance of Scientific Careers

Discussion Group 80-B reviewed at length the very useful documents prepared by the National Science Foundation (NSF) staff. Many ideas and suggestions for possible National Science Board (NSB) action and for possible NSF programs were discussed. It should be noted that because of time constraints the Discussion Group was unable to give serious consideration to the important traditional responsibilities of the NSB and NSF in the support of graduate education.

NSB Members were in agreement that the need to examine and maintain the quality of the entire science and engineering education system is of paramount importance. Members also agreed that this matter is of concern to the entire Nation, not just to NSF or NSB.

The following is a brief summary of salient features of the discussion:

Development of Scientific and Engineering Careers

Within the past decade, less and less importance has been given to the teaching of science and mathematics in American secondary schools. While this decreased commitment has become evident in the United States, other countries, namely Germany, Japan and Russia have demonstrated an increasing emphasis on the teaching of science and mathematics. For example, mathematics instruction has a more rapid pace in Japan than in the United States, and a much higher proportion of students take the more advanced courses. Geometry is regularly taught in the seventh, eighth, and ninth grades in Japan while trigonometry, calculus, probability, and statistics are learned in high school.

Science and engineering education in colleges and universities has developed strains from the transition from an extended period of growth to a period with decreasing rate of student enrollment and decreasing financial support. These strains, coupled with inflation, aging equipment, aging facilities, and fewer opportunities for employment of young scientists on faculties, have created serious problems for academic science and engineering.

The ineffective coordination between science and engineering education programs of secondary schools, community colleges, and four-year colleges and universities has created gaps in training which in turn has led to a draining away of valuable human resources from the pool of Americans who can contribute to society in the areas of science and engineering.

The need to provide non-science students at the secondary and college level with adequate mathematical and science education continues, and in fact appears to be a more serious concern than a decade ago because of the de-emphasis given to science and mathematics education throughout the entire educational system in the United States.

Maintenance of Scientific Careers

It appears that while continuing education and development is a substantial enterprise in terms of investment and participation of individual scientists and engineers and their employers, it remains a highly fractionated, uncoordinated set of operations in which industry, academia, the professional societies, and independent entrepreneurs pursue their own individual paths in response to what they perceive to be the needs and opportunities.

The Discussion Group concerned itself at some length with the problem of the loss of proficiency by practicing scientists and engineers, as well as loss of proficiency by science faculty. The Discussion Group wishes to emphasize that it recognizes that continuing education and development at all levels is extremely important. However, it sees an active, important role for NSF primarily in faculty development since it recognizes that industry and business invest huge sums in continuing education of their employees.

NSF could monitor the extent of this industrial commitment to continuing education, and, therefore, make this information readily available to the scientific community.

Short-Term Actions

Short-term actions or activities proposed which seem worthy of the Board's immediate consideration include:

- Communication with appropriate state and local educational entities to describe the Board's concerns with the present state of pre-college science education.
- The collection of information from scientific societies regarding their activities in science education and in continuing education and also the activities of their members.

Major Recommendations

These recommendations are made with the view that the Board will be able to consider in depth its view of the emphasis and priority to be given to science education throughout the NSF.

The first recommendation is that the NSB should reemphasize and fully recognize the tripartite nature of NSF's responsibilities in the entire area of science and engineering education. These three educational responsibilities consist of:

Talented scientific students. The NSF should maintain its commitment for the education and improvement of the education of the many very talented students who show a very early interest in science and engineering, the so-called "top ten" that have a long-term commitment to science.

Education of the potential scientific pool. A commitment to the education of those individuals that are potentially capable in science, but who have not had adequate opportunity to develop their capability in this area. This effort should include an emphasis on pre-college science education in secondary schools.

The general public. A commitment to strengthen the public's comprehension of science and engineering and technology, particularly where the quality of science and mathematics education at the secondary level has deteriorated since the 1960's. A major effort in assisting the public could be supported by upgrading the science and mathematics education at the secondary level, which would make the public more able to comprehend the scientific developements that are so prevalent.

The second recommendation is that NSB prepare a "White Paper" to define the scope, depth of commitment, position and priorities to be given to science education by the Board and by NSF programs. The White Paper could lead to reexamination of the balance of programs committed to science education throughout the Foundation and could permit the Foundation and the Board to develop priorities in this area.

The third recommendation is for the Board to create a Task Committee on science and engineering education whose first charge would be completion of the White Paper proposed above.

Hopefully, the work of this Task Committee could begin early so that it could be helpful in the various budget discussions that come up during the year.

The fourth recommendation includes four suggestions relating to the Board's oversight and implementation of science education throughout NSF and the Country. These are:

-- The Discussion Group highly recommends increased research into better teaching and learning methods of students in the crucial sixth and seventh grade mathematics courses. This particular area is of major concern because inadequate success in these years leads to the loss of valuable human resources for science and mathematics.

-- There should be close coordination of NSF programs with the programs of the Department of Education, especially at this critical time when the Department is in its initial stages of development and this interaction with them would be most meaningful and effective. The Discussion Group urges the Board to ensure that this cooperation occurs.

-- There is an urgent National need to facilitate the vertical coordination of science and engineering education throughout the American educational system.

-- The Discussion Group feels that a physical integration of the Science Education Directorate with the rest of the Foundation is a high priority and one that will be very important as the Foundation further develops science education. It is also an important factor as the Foundation searches for an NSF Director and Assistant Director for Science Education who will accept the responsibility in this area.

Myra J McAuliffe
Prepared by Myra J. McAuliffe
Executive Secretary
Discussion Group 80-B

Eugene H. Cota-Robles /mm via phone To [illegible] 6/25/80
Approved by Dr. Eugene H. Cota-Robles
Chairman, Discussion Group 80-B

June 25, 1980

APPENDIX I

GUIDELINES FOR PREPARATION OF THE *STATUS OF SCIENCE* REVIEW

GUIDELINES FOR THE PREPARATION OF STATUS OF SCIENCE REVIEWS [1]

GUIDELINES FOR PREPARATION OF THE STATUS OF SCIENCE REVIEWS

The *Status of Science Reviews* are intended to provide an overall assessment of the directions and needs of the individual fields of science. Two basic questions are posed:

- What are the important research trends within each major field of science?
- What is the NSF perception of opportunities, responsibilities, and needs in each field of science?

The reviews must provide a concise, balanced, and objective discussion of the individual research disciplines; the status should communicate the excitement of research effort and opportunities for further growth, the concerns of the research community, and the significance of the discipline to the Nation. Careful attention should be given to the role of NSF vis-a-vis other research supporters. The status should describe each of the following elements:

I. Organization of Field and Directions

- General definition of the field of science (example: Chemistry is the study of electronic bonds between atoms and molecules, the transformations of these bonds, and the properties of materials dependent upon these bonds.).
- Concise statement of major research areas within each field (using NSF sector of program titles).
- Document direction, emerging trend of special concerns (for each research area as described in long-range plan).
- Interfield or interdisciplinary trends (across field or multidisciplinary areas of research).

II. Research Opportunities

- Major research opportunities.
- Exciting new developments, trends.
- Continuing NSF research responsibilities (note any responsibilities for "core" support in basic discipline).
- Thrusts thwarted (include research areas limited by funds, instrumentation, equipment, facilities, and manpower).
- Concise statement of major research areas within each field (using NSF sector or program titles).
- Document direction, emerging trend of special concerns (for each research area as described in long-range plan).
- Interfield or interdisciplinary trends (across field or multidisciplinary areas of research).

III. NSF Funding Patterns

- NSF funding by program area) by year (FY 1975-79).
  - Total $ amount awarded ($K).
  - Average request per proposal ($K).
  - Average grant per proposal ($K).

- Proposal pressure.
  - Total number of proposals received during FY 1977, 1976, and 1975.
  - "Success ratio"–percentage of awards to reviews completed.
  - Note any significant changes in proposal pressure from past experience.

- Funding flexibility.
  - Percentage of total budget committed to

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[1] Source: U.S. National Science Board. Status of Science Reviews, 1980, Prepared by the Division of Strategic Planning and Analysis, Office of Planning and Resources Management, National Science Foundation. Nov. 1979, pp. 376-378. (NSB-79-370, Limited Distribution for Internal Administrative Use Only.)

    major laboratories, to renewals or continuations.
    - Percentage of total budget available for new proposals (uncommitted funds).
    - "Turnover rate"—percentage of new starts in FY 1977.

- Instrumentation budget.
    - Average funds requested per proposal for instrumentation.
    - Total instrumentation funds available.

- Facility support.
    - NSF facility support—facilities for which NSF has complete or major responsibility (provides percent NSF support), including dollar level, number of years provided, and present estimated term of commitment.
    - Other facilities important to NSF-supported researchers-facilities for which other organizations, Federal agencies have responsibility (example—Fermi Lab for High-Energy Physics maintained by Department of Energy).
    - Note any expansion, phase-out plans.

- New opportunities.
    - Note any special instrumentation of new facilities which are opening up entirely new research areas.

IV. Manpower

- Manpower intensity.
    - Describe "big science-little science."

- Manpower situation.
- Availability of qualified researchers, employment opportunities, career mobility (retention rates), expanding or contracting research areas.
- Future manpower availability.
    - New doctorate enrollment.
    - Doctorate recipients in 1978 by field (men, women, minority).
    - Enrollment, both graduate and undergraduate.

- Employment plans of recent graduates.
    - Plans of current postdoctorates.
    - Planned employment and activity of recent graduates.

- Professional employment.
    - Sector employed.
    - Note any significant shifts from historic patterns.
    - Tenure ratio at universities, colleges.

V. Infrastructure and NSF Role

- Federal support.
    - Total estimated Federal support by field.
    - Describe directions, emphasis, budget, including new initiatives, reprogramming, cutbacks of other agency support.
    - Note any special relationships of other Federal agencies with NSF (such as shared support).

- Industrial support.
    - Describe extent of industrial interest and estimate level of support where possible.
    - Special areas of significant industrial interest.

- Special university roles.
  - Note any special or unique role which individual universities have sought to provide with or without Federal support (example—University of Rochester Center for Laser Energetics).

- International status (identify nations involved).

  - Describe significant research programs maintained by other nations.
  - Identify cooperative ventures.
  - Identify competitive concerns.
  - Note opportunities for further joint efforts.
  - Estimate funding levels (as compared to United States in areas of significant interest.

- NSF role vis-a-vis other major supporters (Federal agencies, industry) by area where necessary.
  - Special emphasis of NSF efforts compared to other support.
  - Opportunities, concerns arising from other Federal agency actions.

VI. Special Considerations

- Special studies/reviews.
  - Note any special interagency studies, reviews in progress or recently completed.
  - Note any special studies by other organizations impacting NSF programs.

- Federal policy areas.
  - Special restrictions, legal factors, influencing the conduct of research (example: guidelines for DNA research; national security restrictions on cryptology).

- New Federal initiatives or changes in research directions.

APPENDIX J

RECOMMENDATIONS ON THE NATIONAL SCIENCE FOUNDATION LONG-RANGE PLANS FOR FISCAL YEAR 1981 AND SUBSEQUENT YEARS, AS ACCEPTED BY THE NATIONAL SCIENCE BOARD AT ITS 204TH MEETING ON FEBRUARY 15–16, 1979, NSB–79–89

PRIVILEGED INFORMATION

NSB-79-89
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NSB/Res-79-23/B

RECOMMENDATIONS ON NATIONAL SCIENCE FOUNDATION LONG-RANGE PLANS FOR FISCAL YEAR 1981 AND SUBSEQUENT YEARS AS ACCEPTED BY THE NATIONAL SCIENCE BOARD AT ITS 204TH MEETING ON FEBRUARY 15-16, 1979

Working Groups 1 and 2 of the National Science Board met from 10:00 a.m. to 1:00 p.m. and from 2:15 to 5:00 p.m. on Thursday, February 15, 1979, to consider the long-range plans for fiscal year 1981 and subsequent years prepared by the staff of the National Science Foundation. In the morning session, Assistant Directors presented summaries of the plans; in both morning and afternoon sessions, Members of the Board discussed various aspects of the plans with staff members.

The purpose of the discussions was to provide guidance for the Foundation's interaction with the Office of Management and Budget (OMB) in March in connection with the President's Spring review of agency plans and estimates for fiscal year 1981 and beyond.

The guidance is as follows:

1. The National Science Foundation should urge the President to continue the present policy of providing real growth (above inflation) for the Government-wide total of basic research funding. As part of this policy the Committee on Budget should prepare its preliminary estimates to include a total for Mathematical and Physical Sciences, and Engineering (MPE), Astronomical, Atmospheric, Earth, and Ocean Sciences (AAEO), and Biological, Behavioral, and Social Sciences (BBS) that provides for real growth, but will not be viewed by the President as an "unrealistic" request.

2. Within that total two needs should be expressed as being of higher priority than any individual thrusts:

    a. increasing core support (defined as both increasing average award size and increasing the ratio of awards to declinations, depending on the discipline); and,

    b. further increasing funding for scientific instrumentation and equipment, in order to replace deteriorating equipment as well as to provide more modern instruments.

3. The National Science Board agreed with the following emphases as set forth in the plans, if sufficient funds are available after the two overriding priorities above are considered:

    a. in MPE: emphasis on computer science and engineering;

    b. in AAEO: emphasis on the 25-meter millimeter wave telescope, and on a substantial post-International Decade of Ocean Exploration Program in oceanography including updating the academic fleet; in addition, the Consortium for Continental Reflection Profiling (COCORP) Program should eventually be emphasized equally with the future oceanography thrust;

PRIVILEGED INFORMATION

(Note: NSB staff gave CRS permission to reproduce this item.)

c. in BBS: emphasis on selected areas of plant sciences and environmental biology, and on increases generally for physiological, cellular, and molecular biology.

4. If the start of an Ocean Margin Drilling Program is proposed for the fiscal year 1981 budget, it should be presented to OMB as a proposed Presidential interagency science initiative, over and above any other budget total otherwise available to the Foundation.

5. In line with the "big science" policies and procedures adopted by the National Science Board in January 1979, the Committee on Budget should examine cost estimates for each large capital investment item proposed for initiation in fiscal year 1981, such as the Ocean Margin Drilling Program and the 25-meter millimeter wave telescope.

6. The Board recommended that the plans and priorities presented for Science Education be implemented with reasonable budget support.

7. The Board agreed with the plans and priorities expressed by the Directorate for Scientific, Technological, and International Affairs. Furthermore, the Board commended that Directorate for its clear and thoughtful planning and its differential decisions.

8. The Committee on Budget should examine each proposed program in the Directorate for Applied Science and Research Applications with a view to determining whether a strategy of concentrating higher levels of funds on a smaller number of programs should be considered.

Finally, the National Science Board expressed its appreciation to the National Science Foundation staff who assisted in the development of the plans.

February 23, 1979

APPENDIX K

NATIONAL SCIENCE BOARD. COMMITTEE ON BUDGET REPORT AND REVIEW OF PLANS AND ESTIMATES FOR FISCAL YEAR 1981 AND SUBSEQUENT YEARS, NSB/BU-79-3

ached to
NSB-79-141)

NSB/BU-79-3 (Limited
Distribution)

NATIONAL SCIENCE FOUNDATION
NATIONAL SCIENCE BOARD COMMITTEE ON BUDGET
REPORT ON REVIEW OF PLANS AND ESTIMATES
FOR FY 1981 AND SUBSEQUENT YEARS [1]

The Committee on Budget submits the following

REPORT

I. Purpose

To provide Board members and NSF staff an opportunity to comment on the estimates recommended for transmittal to OMB.

II. Background

The Committee held its thirty-fourth meeting from 1:00 p.m. to 3:30 p.m February 16, 1979, in Room 543 with Dr. Koshland presiding, and Drs. Shields, Rice and Friedl participating. The purpose of the meeting was to prepare preliminary budget estimates for FY 1981-1983, for the consideration of the National Science Board and subsequent transmittal to the Office of Management and Budget in connection with the President's Spring review of the FY 1981 budget.

Earlier in the day the Board provided its general policy guidance to the Committee, based on its review of the Foundation's long-range plans (see attachment entitled "NSB Review of NSF Long Range Plans for FY 1981 and Following Years".) In its discussions, the Committee fully considered each of the points of the Board's guidance. In addition, the Committee kept in mind the need to provide general information and broad estimates to OMB at this stage of the budget process, without preempting the more detailed budget work that will take place during the preparation of the zero-based budget in the summer. The Committee was also mindful that development of the FY 1981 budget is still in an early stage and that the recommendations herein may need to be reconsidered if the President's "mark" is significantly different from these estimates.

PRIVILEGED INFORMATION (Note: NSB staff gave CRS permission to reproduce this item.)

[1] Source: CS: 206: 13-17.

Recommendations for FY 1981

The following table displays the estimates for FY 1981 resulting from to the Committee's discussions. The rationale for the estimates is then presented followed by the Committee's recommended totals for FY 1981 and FY 1982.

PROPOSED FY 1981 ESTIMATES TO OMB
(DOLLARS IN MILLIONS)

CATEGORY	FY 1980 BUDGET TO CONGRESS	FY 1981 COMMITTEE RECOM.	INCREASE		AS PERCENT OF TOTAL	
			$	%	1980	1981
MPE, AAEO, BBS	$712.5	$843.7	$131.2	18.4%	70.8	71.6
Antarctic	55.0	60.6	5.6	10.2	5.5	5.1
ASRA	62.4	72.5	10.1	16.2	6.2	6.2
SE	84.7	100.0	15.3	18.1	8.4	8.5
STIA	25.8	31.0	5.2	20.2	2.6	2.6
PD&M	59.6	64.0	4.4	7.4	5.9	5.4
SFC	6.0	6.0	0	---	0.6	0.5
Subtotal	$1,006.0	$1,177.8	$171.8	17.1%	100.0	100.0
Ocean Margin Drilling	(2.1)	47.8	45.7			
	$1,006.0	$1,225.6	$217.5	21.6%		

DERIVATION OF THE FY 1981 ESTIMATES

MPA, AAEO, BBS

In its guidance, the Board instructed the Committee to include an amount for real growth (above inflation) in basic research, but one that would not be viewed by the President as "unrealistic". Further, the Board specified that general increases for basic research were to be focused on two needs: to increase core support in "SRPS-type" programs, and to further increase funding for instrumentation and equipment (in project grants as well as instrumentation programs.)

The Committee recommends an increase of 8% real growth for these purposes; inflation in FY 1981 is estimated by the Committee as 9%, leading to the recommendation that the Foundation seek an increase of 17% for the two purposes mentioned. Based on an estimate of $518 million total in the proposed FY 1980 budget for both "SRPS-type" projects and instrumentation, a 17% increase amounts to $88 million (rounded).

The Board also instructed the Committee to budget for certain specific emphases, if sufficient funds were available after the two overriding priorities described above were considered. The Committee recommends a total of $23.7 million for the emphases called out by the Board, as follows:

- For 11% increases in the following fields, in addition to 17% increases for "SRPS-type" projects and instrumentation:

	FY 1980 budget	11% for spec. emphasis
Computer Science	19.3	2.2
Engineering	54.3	6.0
Physiological, Cellular, and Molecular Biology	70.3	7.7
Total		$15.9 million

- For long-term ecological research, in addition to a 17% increase in Environmental Biology for "SRPS-type" projects and instrumentation: $3.4 million

- For the first year costs of the 25 Meter Diameter Millimeter Wave Telescope: $4.4 million

The Committee notes that AAEO has included funding for the telescope within its "no growth" budget. The Committee recommends that, at this stage of the planning process, the telescope be considered as special emphasis item for Astronomy, above any general increase--but that this status be reconsidered if the President's "mark" is less than recommended herein, to see whether it should be included within a general increase and not as a special emphasis.

The Committee recognizes the possibility that the total FY 1981 budget available to the Foundation may turn out to be less than the amount recommended in this report. In that event, the committee recommends reducing or eliminating the proposed increases for the special emphases described above before reducing the proposed increase for "SRPS-type" projects and instrumentation.

Finally, for the remainder of the budgets of the three directorates (estimated to be $195 million after "SRPS-type" programs and instrumentation have been taken into account), the Committee recommends an inflation adjustment of 9%, or about $17.5 million.

The following table summarizes the Committee's estimates for increases in MPE, AAEOS, and BBS:

FY 1980 proposed budget to Congress	$712.5
"SRPS-type" projects and instrumentation	88.0
Special emphases	23.7
Inflation in remaining programs	17.5
Total	$843.7

Antarctic

For planning purposes, the Committee recommends an inflation adjustment of 9% in the overall total, plus 8% for growth in the research program. This amounts to a total of $60.6 million for FY 1981, compared with $55 million in the FY 1980 budget proposed to Congress.

ASRA

The Committee recommends a total of $72.5 million; an increase of $10.1 million (or 16.2%) over the FY 1980 budget to Congress. This amount will provide for an inflation adjustment of 9%, and some funds for real growth in a limited number of programs.

The Committee recognizes that the Government-wide review of industrial innovation now underway may result in Presidential policies encouraging a higher level of funding for industry-related programs similar to some now funded by ASRA.

The results of that review will not be known until mid-April at the earliest, however; thus, the Committee suggests that the NSB reconsider the ASRA budget later in the year when more information is available.

SE

The Board's guidance to the Committee stated that the plans and priorities presented for Science Education should be implemented with reasonable budget support. The Committee believes that a reasonable level would be $100 million, an increase of 18.1% over the FY 1980 budget to Congress.

The Committee felt strongly that the entire amount requested by the Directorate ($106.7 million) would be well spent, but considerations about the balance among the various missions and programs of the Foundation lead to recommending a more gradual increase. The amount recommended fully provides for the new directions in early adolescence, but little growth above inflation in other SE programs.Furthermore, the Committee strongly endorses the Directorate's plans, particularly the new directions toward early adolescence programs, and anticipates providing significant increases for SE programs in FY 1982 and following years.

STIA

The Committee recommends a total of $31 million, an increase of $5.2 million (or 20%) over the FY 1980 budget to Congress. This amount would provide for an inflation adjustment of 9%; an increase for real growth in international cooperative programs with Western Europe, less-developed countries, and China; and some funds for real growth in other STIA programs. The total includes $600,000 for NSF planning and evaluation, the same amount as in FY 1980.

PD&M

The Committee recommends an increase of $4.4 million, or 7.4%, over the FY 1980 budget to Congress. This would provide for an anticipated Federal pay adjustment of 5.5%, a general inflation adjustment of 9% for other categories, and funding for some additional full-time staff if the need is shown by the results of the Foundation's staffing study.

Foreign Currency

The Committee recommends $6 million, the same amount as in FY 1980.

IV. Estimates for FY 1982 and FY 1983

For an overall budget total, the Committee recommends budgeting for 5% real growth above inflation, plus consideration of a limited number of particular special items. On this basis, using a 9% inflation adjustment in both years and estimating $50 million for special items (that cannot be specifically identified this early in the planning process) the resulting totals would be $1,381 million for FY 1982 and $1,625 million for FY 1983, plus the costs of an Ocean Margin Drilling program.

V. Ocean Margin Drilling

The NSB guidance to the Committee stated that if an Ocean Margin Drilling program is proposed to OMB as part of the FY 1981 plans and estimates, it should be presented as a Presidential interagency initiative, over and above any budget total otherwise available to NSF.

Such a program has been under consideration by an ad hoc committee of the NSB. The ad hoc committee has recommended that funding be included in the estimates presented to OMB, and supplied estimates for this purpose. These have been presented in the table on page 2.

With regard to budgetary estimates, as well as the substantive merit of a program, the Committee on Budget defers to the ad hoc committee. The Committee on Budget notes, however, that in the event the program is approved, there is no certainty that the President will provide funding over and above the NSF budget; a constrained budget "mark" is equally likely.

APPENDIX L

NEW NSF PROGRAMS APPROVED BY THE NSB BETWEEN THE JULY 19-20, 1968 RESOLUTION AND THE 1976 BIENNIAL REVIEW

New NSF Programs Approved By the NSB Between the July 19-20, 1968 Resolution and the 1976 Biennial Review 1/

Basic Research	Applied or Non-Basic Research	Origin
International Decade of Ocean Exploration, Apr. 1971		Vice-President, in a letter dated Nov. 7, 1969, designating NSF as lead agency for IDOE, pursuant to announcement of Chairman of National Council of Marine Resources and Engineering Development 2/
Arctic Research Programs, Mar. 1971		Vice-President, as above, who extended NSF's role as the lead agency in Arctic research 2/
	Research Applied to National Needs (RANN)	Presidential initiative pursuant to Pres. Nixon's New Technological Opportunites Program (NTOP), and congressional directive, in P.L. 90-407, giving NSF authority for applied research. The Directorate for Research Applications was established on March 5, 1971.
	Energy Research and Technology, Nov. 1972	
	Earthquake Engineering (Disasters and Natural Hazards), Nov. 1972	
	Fire Research, Nov. 1972	
	Weather Modification, Oct. 1972	"
	Social Data and Community Structure, Feb. 1973	"
	Human Resources and Services, Feb. 1973	"
	Municipal Subsystems, Operations, and Services, Feb. 1973	"
	Urban Technology, Feb. 1973	"
	Technological Opportunities, Mar. 1973	"
	Exploratory Research and Problem Assessment Mar. 1973	
	Intergovernmental Science, May 1970	"

Basic Research	Applied or Non-Basic Research	Origin
Special Foreign Currency Program for Scientific and Technological Information, Apr. 1971		NSF initiated
	College Science Improvement Program (So-called predominantly Black Colleges) Apr. 1971, 1972 (Now called Minority Institutions Science Improvement Program)	Congressionally initiated, according to Appendix II, Draft report on "Flexibility of the NSF Act as Illustrated by NSF Programs Started and Ended in Period FY 1968-1978" 3/
	Technology Assessment	Initiated by Congress. P.L. 92-484, creating the Congressional Office of Technology Assessment, amended section 3(b) of the NSF Act to specifically authorize NSF to initiate and support scientific activities in conection with matters relating to "the effect of scientific applications upon society." 4/
	Student-originated Studies, Jan. 1971	According to P.L. 95-434, the FY 1979 Authorization Act, the Congress recommended funding for the program to be started at the level of $2.5 million and, in addition, recommended the continuation of a project on undergraduate research participation. 5/
	Comprehensive Assistance to Undergraduate Science Education (CAUSE), Oct. 1975	Congressionally initiated in P.L. 94-86, the NSF FY 1976 Authorization Act, which authorized and directed NSF to initiate such a program intended to strengthen science education

	capabilities of undergraduate or small schools. The program allocated not less than $15 million of which $3.5 million must be awarded to two-year institutions. 6/
Climate Dynamics Program, Oct. 1975	NSF Initiative 7/

1/ Memo to Members of National Science Board. Subject: Biennial Business--Review of Delegations of Authority From the Board to the Director and/or the Executive Committee, May 19, 1976, NSB-76-165.

2/ Organizational Development of the National Science Foundation, NSF Manual, No. 10, p. 83.

3/ Appendix to NSB Ad Hoc Committee on NSF Act Review Report.

4/ Organizational Development of the National Science Foundation, NSF Manual No. 10, p 97.

5/ NSF. Analysis of NSF FY 1979 Legislation, p. 15.

6/ U.S. Congress. Senate. Commitee of Conference. National Science Foundation Authroization ACt, 1976. Conference Report to accompany H.R.4723. Washington, U.S. Govt. Print. Off., 1975, pp. 3-4. (Senate Report No. 94-339).

7/ Draft NSF Staff report entitled "Flexibility of the NSF Act as Illustrated by NSF Programs Started and Ended in Period FY 1968-FY1978," Draft Appendix II, list in Appendix. Provided by NSF.

APPENDIX M

NEW PROGRAMS INSTITUTED BETWEEN 1976 AND 1978, REPORTED AT THE BIENNIAL REVIEW OF DELEGATIONS OF AUTHORITY TO THE DIRECTOR, MAY 1978

New Programs Instituted Between 1976 and 1978, Reported at Biennial Review of Delegations of Authority to the Director, May 1978 1/

Basic Research	Applied or Non-Basic Research	Origin
	Weather Modification (transferred from RANN/ASRA, 1977)	Legacy of congressionally/OMB instituted RANN program
	Technology Assessment (transferred from RANN/ASRA in 1977)	Legacy of congressional mandate for NSF to do technology assessment, and of the Congressionally/OMB instituted RANN program.
	Policy Research and Analysis Program	Created pursuant to OMB instructions to help NSF staff support the Director of NSF when was also the science advisor. 2/
	Minority Graduate Fellowships, Jan. 1978	Congressionally initiated in P.L. 94-471, the FY 1977 NSF Authorization Act which authorized and directed NSF to make planning grants for Minority Centers for Graduate Education in Science and Engineering. 3/
	Pre-College Teacher Improvement, Nov. 1976	According to the FY 1978 Authorization Act, the Congress apparently initiated this program and in 1977 authorized $6 million urging that NSF use not less than 25 percent of the funds available to train teachers in methods to encourage students to explore the interaction between science and society. 4/
	Resource Center for Science and Engineering, Nov. 1977	Congressionally initiated in the FY 1977 NSF Authorization Act and continuously funded at the insistence of the Senate despite House Authorization Committee objections. Thus $2.8 million was mandated in the FY 1979 authorization act, P.L. 95-434. The language of the Act instructed NSF to seek expansion of the Centers. 5/

Basic Research	Applied or Non-Basic Research	Origin
Research Initiation and Support		Congressionally initiated language in the FY 1976 Authorization Act authorized and directed NSF to conduct a Research Initiation and Support Program (RIAS) to strengthen training and research for young scientists at the graduate and postgraduate levels. The awards are competitive and not to exceed a period of 4 years. The minimum floor was $5 million. The program replaced the former Institutional Support for Science Program. 6/
	Research in Science Education, Nov. 1976	Initiated by NSF 7/
	Science for Citizens, Nov. 1977	Congressionally initiated with the FY 1976 and FY 1977 authorization act. No funding was requested in the FY 1976 bill. The objective of the program was to improve public understanding of science policy issues, facilitate the participation of scientists and students in public activitites, enable nonprofit citizens public interest groups to acquire technical expertise and provide funds for research to improve such programs. 8/ The FY 1977 statute directed the NSF to conduct such a program, as well as an augmented Public Understanding of Science Program, funded at the

Basic Research	Applied or Non-Basic Research	Origin
		minimum level of $3 million. Specific objectives and program subelements were authorized and NSF was required to report to Congress on progress made. (P.L. 94-471.) 9/

1/ Memorandum to Members of the National Science Board. Subject: Biennial Review of Delegations of Authority to Director and/or Executive Commitee, May 11, 1978, NSB-78-217

2/ Interview with an official of the Office of Science and Technology Policy 8/80.

3/ NSF. Analysis of FY 1977 Legislation, p. 18. (Compiled by NSF.)

4/ NSF. Analysis of FY 1978 Authorization Act, p. 13, reporting on P.L. 95-99. (Compiled by NSF.)

5/ NSF. Analysis of FY 1979 Legislation, p. 14. (Compiled by NSF.)

6/ U.S. Congress. Senate. Committee of Conference. National Science Foundation Authorization Act, 1976. Conference report to accompany H.R. 4723. Washington, U.S. Govt. Print. Off., 1975, p. 3. (Senate report no. 94-339. 94th Congress, 1st session) and NSF. Analysis of FY 1976 NSF Legislation, p. 6. (Compiled by NSF .)

7/ Flexibility of the NSF Act as Illustrated by NSF Programs Started and Ended in Period FY 1968-FY 1978, op. cit.

8/ National Science Foundation Authorization ACt, 1976. Conference Report to accompany H.R. 4723, op. cit., p. 3; ES 178: 11; 194:10; and NSF. Analysis of FY 1976 Legislation, p. 1. (Compiled by NSF.)

9/ NSF. Analysis of FY 1977 Legislation, p. 14. (Compiled by NSF.)

APPENDIX N

NEW PROGRAMS INSTITUTED BETWEEN 1978 AND 1980 AS REPORTED AT THE NSB BIENNIAL REVIEW OF DELEGATIONS OF AUTHORITY TO THE DIRECTOR, MAY 1980

New Programs Insituted Between 1978 and 1980 as Reported At NSB Biennial Review of Delegations of Authority to Director, May 1980 1/

Basic Research	Applied or Non-Basic Research	Origin
Mathematical Sciences Research Fellowship Program (approved by NSB in Nov. 1978 on a two-year trial basis; authorization expires in Nov. 1980)		Estimated: NSF
	Research Initiation Grants (Applied Social and Behavioral Sciences), Sept. 1979	Estimated: Congress
Human Nutrition Program, Nov. 1978		Directed by Congress in Senate Rept. no. 95-1060, funded at the level of $3 million. 2/
	Science and Technology Aid to the Handicapped, Nov. 1978	Congress directed NSF to establish this program funded at the level of $2 million in the FY 1979 Authorization Act (P.L. 95-434.) 3/
	Experimental Program to Stimulate Competitive Research, Jan. 1978	Congress has consistently requested NSF to use the dual criteria of quality science and geographic distribution (per the original enabling legislation) when awarding funds. NSF seems to feel quality research is the governing criterion. Therefore Congress consistently urged compensating expenditures. In the the FY 1979 appropriations report, the House urged NSF to allocate $1 million to carry out a program to assist institutions in States now competing less successfully to improve their ability to participate in competitive research programs. 4/
	Appropriate Technology, Jan. 1980	Congress directed NSF to establish this program in the FY 1979 Authorization bill, and authorized expenditure of $.2 million for program design. (P.L. 95-434.) $2 million for this program authorized in NSF Authorization Act for FY 1980 (Sec. 2 of P.L. 96-44.) 5/

Basic Research	Applied or Non-Basic Research	Origin
	Physically Handicapped in Science, Mar. 1979	Initiated by Congress in Fiscal Year 1977 NSF Authorization Act, when the congressional authorization ear-marked $500,000 for experimental forums, conferences and other activities to improve scientific literacy and to encourage and assist handicapped individuals to undertake careers in scientific research. 6/
	Public Service Science Center, Jan. 1980	Intitiated by Congress in the Fiscal Year 1977 Authorization Act. 7/

1/ Memorandum to Members of the National Science Board. Subject: Biennial Review of Delegations of Authority to Director and/or Executive Committee, May 8, 1980, NSB-80-198.

2/ NSF. Analysis of FY 1979 Authorization Legislation, p.ii (Compiled by NSF.)

3/ Ibid., p. 19.

4/ House Report No. 95-1255, as reported in NSF. Analaysis of FY 1979 Legislation, p. 37. (Compiled by NSF.)

5/ NSF. Analysis of FY 1980 NSF Legislation, Nov. 1979. Prepared by OPRM, Division of Budget and Program Analysis, p. 5. (Provided by NSF.)

6/ NSB Minutes, p. 205: 13.

7/ NSB Minutes, p. 194: 10.

APPENDIX O

OTHER NEW IDENTIFIABLE PROGRAM INITIATIVES FROM SOURCES OTHER THAN BIENNIAL REVIEW OF DELEGATIONS OF AUTHOITY TO THE DIRECTOR

Other New Identifiable Program Initiatives From Sources Other Than Biennial Review of Delegations of Authority to the Director

Basic Research	Applied or Non-Basic Research	Origin
National Sea Grant Program		Congressionally initiated 1/
	RANN Program in Technology Assessment, 1971 3 /	Congressionally initiated per passage of P.L. 92-484, the Technology Assessment Act of 1972. The Act amended Sec. 3 (b) of the NSF Act to authorise the Foundation to initiate and support specific scientific activitites in connection with matters relating to "the effects of scientific applications upon society." 2 /
	Amendment of NSF Act to Emphasize Support for Science Education`.	Congressionally initiated per P.L. 92-372, the NSF Authorization Act of 1973. The Act amended sec. 3 (a) (1) of the NSF organic act, by inserting the words "and science education programs at all levels" after "scientific research potential." This change was made to emphasize Congress' continuing interest in and support for science education. 2/
	Coordination of U.S. 1973 Solar Eclipse Research Effort,1972 3/	Initiated by the Administration 1/
Human Cell Biology Program, 1972 3/		Origin: probably the NSF
	Chautauqua Short Courses (College Faculty Short Course)	Intiated by OMB 1/
Materials Research Interdisciplinary Laboratories (transferred from Advanced Research Projects Agency, DOD), 1972 3/		Initiated by the Administration

Basic Research	Applied or Non-Basic Research	Origin
	Research Initiation in Minority Institutions (RIMI), 1972 3/	Origin: probably the Congress
	National R and D Assessment Program, 1973 3/	Origin: probably the Administration
Institutional Grants for Research Management Improvement, 1973 3/		Origin: probably the NSF
	Integrated Pest Management Program, 1973 3/	Origin: probably the NSF
	Experimental R and D Incentives Programs	Initiated by the Administration 1/
	Man-in-the-Arctic Program, 1973 3/	Origin: probably the Administration
	Industrial Research Participation for College Teachers, 1974 3/	Origin: probably the Administration
International Phase of Ocean Deep Sea Drilling, 1974 3/		Origin: probably the Administration
	Science and Technology Policy Research, 1974 3/	Initiated by the Administration 1/
	Women in Science Program, 1974 3/	Origin: probably the Congress
	Advanced Automotive Propulsion, 1975 3/	Origin: probably the Congress
	Ethical and Human Value Implications of Science and Technology (EHVIST currently EVIST), 1976 3/	Congressionally instituted action the in FY 1976 NSF Authorization the adopted the House requirement of allocating $1.5 million for the program. NSF wanted $400,000. 4/
Cognitive Science Program, 1976 3/		Origin: probably the NSF
Neuroscience Program, 1976 3/		Origin: probably the NSF
	Cooperation in Developing Public Education Programs on Conversion to the Metric System	Congressionally initiated by P.L. 94-168, the Metric Conversion Act of 1975, which required NSF to work with the Metric Board and other agencies. 2/

Basic Research	Applied or Non-Basic Research	Origin
Expansion of Biological, Behavioral, and Social Sciences Instrumentation Support, 1977 3/		Origin: probably the NSF
Recombinant DNA Research, Expansion, 1977 3/		Origin: probably the NSF
Closed-cycle Helium Liquefaction Facilities, 1977 3/		Origin: probably the NSF
Gravitational Physics Program, 1977 3/		Origin: probably the NSF
	Applied Research Dealing With Solar Energy	The Solar Heating and Cooling Demonstration Act (P.L. 93-409) assigned NSF reponsibility for programs of applied research relevant to improving solar heating components and systems and to the development of commercial application of solar heating and cooling components and systems. 5/
	Coordination of Solar Energy Research	Congressionally initiated with the Solar Energy Research, Development and Demonstration Act (P.L. 93-473), which gave NSF some responsibilities for coordinating some national programs for solar energy research 6/
	Geothermal Energy Research	Congressionally initiated by the Geothermal Energy Research and Demonstration Act (P.L. 93-410), which gave NSF some responsibility for managing and coordinating national programs for geothermal research. 6/

Basic Research	Applied or Non-Basic Research	Origin
	Minorities in Science, 1977 3/	The FY1976 NSF Authorization bill authorized a minimum limitation for Ethnic Minorities and Women in Science of $7 million of which not less than $1.5 million shall be available to develop and test methods of increasing the flow of women into careers in science. 7/ P.L. 94-471 authorized and directed NSF to make planning grants to Minority Centers for Graduate Education in Science and Engineering. 8/
Population Biology and Physiological Ecology, 1977 3/		Origin: probably the NSF
Sacramento Peak Observatory, 1977 3/		Origin: probably the Administration
Participation in Development of a National Climate Program		Initiated by Congress pursuant to P.L. 95-367, the National Climate Program Act, that established a national program to "assist the Nation and the world to understand and respond to natural and man-induced climate processes and their implications." The NSF was to develop a five-year plan in cooperation with other agencies.
	Earthquake Hazards Reduction Program, 1977	Authorized by P.L. 95-124, the Earthquake Hazards Reduction Act of 1977, which directed the President to establish a coordinated earthquake hazards reduction program. NSF was named a cooperating agency.

Basic Research	Applied or Non-Basic Research	Origin
	Establishment of Office of Small Business Research and Development (to assist the small business community in communicating with NSF, to see that any small business set aside is used fully and to insure that NSF uses small businesses).	Congressionally initiated pursuant to P.L. 94-471, the National Science Foundation Act of 1977. 9/
	State Science Engineering and Technology, 1977 3 /	The NSF did not request any funding for this program in the FY 1980 budget. The NSF Authorization bill for FY 1980 (P.L. 96-44) authorized funding at the level of $1,500,000 for this program. 10/
	Industry/University Cooperative Research, 1978 3/	The FY 1978 Authorization Act for NSF, P.L. 95-99, authorized and directed NSF to increase support for cooperative research projects involving researchers from the industrial and academic sectors. 11/ NSB originally opposed this effort and the program to support basic research in industry on the grounds that to do so would siphon research dollars from academic institutions.
	NSF Support of Basic Research in Industry	The Congress said that the Foundation was misinterpreting the organic act since it used special criteria to award funds to industry, making industrial competition more difficult. Congress modified NSF practices by reporting that "With regard to competition for basic research

Basic Research	Applied or Non-Basic Research	Origin
		support, NSF's Organic Act does does require the use of special criteria in evaluating industrially based research proposals. Rather the application of such criteria is the result of National Science Board policy." Nevertheless, NSF should proceed cautiously in this new area. 12/
	Establishment of spending floors for "Applied Social Research," and for "Policy-related Scientific Research," in the RANN Program.	NSF objections to spending for applied research prompted the House in the FY 1978 Authorization Act to insist that not less than 25 percent of RANN funds be used for these research areas to promote research "directed toward increasing the cost-effectiveness of policies and programs dealing with urban and human service problems at the Federal, State, and local government levels . . . [and to improve delivery of] humaan services . . . . " 13/
Establishment of Basic Research Stability Grants Program, replacing the RIAS program.		Initiated by NSF but Congress added instructions that the needs of small institutions should be accounted for in the program implementation. phase. Authorization was at the level of $4.5 million. 14/
	Establishment of Alan T. Waterman Award (to recognize and encourage the work of younger scientists. The medal consists of an award and financial prize not to exceed $50,000).	Congressionally initiated with the NSF FY 1976 Authorization Act, (P.L. 94-86.) 15/
	Establishment of Public Education Programs on Conversion to the Metric System	Congressionally initiated by P.L. 94-168, the Metric Conversion Act of 1975. 15/

Basic Research	Applied or Non-Basic Research	Origin
	Expansion of NSF International Science Policy Analysis Role	Section 3 of the FY 1977 NSF Authorization Act P.L. 94-471, directs NSF to support basic and applied research, education programs, policy analysis, science information and cooperative programs to promote international cooperation and resolve critical world problems. 16/
	Sustained Support for Applied Research	The Congress noted while statutory directive was unnecessary, it urged NSF to provide sustained support for applied research as directed in the Senate authorization bill, to encourage the establishment of interdisciplinary teams of researchers to address selected problems of national importance. An objective would be to build an independent interdisciplinary research capacity. 17/
	Solar Energy Satellite Feasibility Study	The Congress initiated action to authorize funding totaling $.5 million. OSTP was instructed to work closely with NSF in this review. 18/
	Science and Society Program	In the fiscal year 1978 authorization act, (P.L. 95-99), the Congress established the program, which had several parts: public understanding of public policy related to science, participation of scientists in public policy deliberations, assist citizens participate in such deliberations, establishment of internships, regional forums, and training. 19/

Basic Research	Applied or Non-Basic Research	Origin
	Establishment of Resource Centers for Science and Engineering	Congress instructed NSF to establish such a center at an educational institution which would attract minorities, low income persons, and to serve as a S and T resource center for the community and adjacent small schools, in conjunction with pre-college programs. 20/ Authorization was at the level of $3 million. 21/
Regional Instrumentation Facilities, 1978		Initiated by NSF 22/
	Feasibility study: the Director of NSF is to cooperate with other agencies to demonstrate whether solar energy can be transmitted to earth by using orbital materials from lunar or asteridal materials. A report was to be prepared for the President and Congress.	Congressionally initiated pursuant to the FY 1979 Authorization Act, P.L. 95-434.
	NSF is instructed to study the balance between big and little science project funding to obtain a better balance for funding of small projects	Recommended in House Report 95-99 , the FY 1979 House Authorization Act. 23/
	Establishment of a Program of Research and Public Education in Appropriate Technology	The NSF did not request authorization in this area. The FY 1980 NSF Authorization Act (P.L. 96-44) authorized $750,000 for a program of education in appropriate technology. 24/
	NSF is instructed to conduct a Flood Hazard Mitigation Study and to report to the Congress with specific program recommendations by the end of FY1980.	Congressionally instituted pursuant to P.L. 96-44. The work is to be coordinated with other agencies and is to include recommendations for Federal action. The statute instructed NSF to establish a broadly constituted external advisory group to assist in the study. 25/

Basic Research	Applied or Non-Basic Research	Origin
	Authorization of several actions to enlarge NSF programs for minorities and women and to establish this effort as a national policy.	Congressionally initiated in 1980.

FOOTNOTES

1/ "Flexibility of the NSF Act as Illustrated by NSF Programs Started and Ended in Period FY 1968-FY 1978," op cit.

2/ NSF. Organizational Development of the National Science Foundation. NSF. Organization Manual, Manual no. 10. (Provided by NSF.)

3/ Appendix I to NSB Ad Hoc Committee on NSF Review Act Report.

4/ NSF. Analysis of FY 1976 Legislation, p. 3.

5/ NSF. Organization Manual no. 10, op. cit., p. 105.

6/ Ibid., p. 106.

7/ NSF Analysis of FY 1976 Legislation, p. 2.

8/ P.L. 94-471, as reported in NSF. Analysis of FY 1977 Legislation, p. 18.

9/ P.L. 95-99, as reported in NSF. Analysis of FY 1978 Legislation, p. 116.

10/ Analysis of FY 1980 NSF Legislation, Nov. 1979, Prepared by OPRM, Division of Budget and Program Analysis, p. 34.

11/ NSF. Analysis of FY 1978 Legislation, p. 10.

12/ P.L. 95-99, as reported in NSF. Analysis of FY 1978 Legislation, p. 26.

13/ P.L. 95-99, discussed in NSF. Analysis of FY 1978 Legislation, p. 8.

14/ P.L. 95-99, discussed in NSF. Analysis of FY 1978 Legislation, p. 33.

15/ Ibid., p. 113.

16/ Ibid., p. 32.

17/ P.L. 95-99, as reported in NSF. Analysis of FY 1978 Legislation, p. 56.

18/ P.L. 95-434, FY 1979 authorization bill as reported in NSF. Analysis of FY 1979 Legislation, p. 19.

19/ P.L. 95-99, as reported in NSF. Analaysis of NSF FY 1978 Legislation, pp. 16-17.

20/ P.L. 95-99, as reported in NSF. Analysis of NSF FY 1978 Legislation, pp. 18-19.

21/ Ibid., p. 46.

22/ Flexibility of the NSF Act as Illustrated by NSF Programs Started and Ended in Period FY 1968-FY 1978, op. cit.

23/ NSF. Analysis of FY 1979 Legislation, op. cit.

24/ Ibid., p. 54.

25/ Ibid., p. 9.

APPENDIX P

ILLUSTRATIONS OF SIGNIFICANT, BUT LESSER REORGANIZATIONS IN WHICH THE BOARD DID NOT PLAY A MAJOR ROLE

Typically the Director notifies the Board of reorganizations after they have been made. Notification occurs in the Director's report section of each meeting. Some of the major changes made by the Director with little apparent discussion by the Board are discussed next.

1. Reorganization of NSF Directorates, 1970

The first major reorganization of the Foundation after the passage of P.L. 90–407 occurred on July 14, 1969, when Dr. William D. McElroy assumed the directorship of the Foundation.

The statute called for four presidentially appointed Assistant Directors. During October 1969, the Director announced the creation of four Directorates in the areas of education, institutional programs, national and international programs, and research. The President submitted nominees for the Assistant Directors on March 27, 1970; the Senate confirmed these nominations on June 20, 1970. The Board's role was limited to suggesting nominees.[1]

2. Establishment of Executive Council and Management Council

Dr. McElroy has been described as a strong and independent administrator, who often made decisions without consulting the Board. This is in contrast to the patterns which prevailed under the two preceding Directors, Haworth and Waterman, and subsequently under Director Atkinson. According to the NSF history, *A Minor Miracle*, written by Milton Lomask, "One of the most striking aspects of the Foundation under Waterman and Haworth had been the close and constant cooperation of Director and NSB. During the McElroy era that spirit diminished noticeably." [2] Director McElroy attributed his lack of consultation with the Board to the need to make decisions quickly in reaction to the needs of OMB and the difficulty he had dealing with the "parochial" attitudes of the Board. The author continued:

> Board members complained that McElroy made "end runs" around them, and the record does show him putting at least one new program into effect without bothering to solicit their approval as required by law.
>
> McElroy's side of this story, as he recalls it now, is that such were his relations with the powerful Office of Management and Budget that "on occasion," he had no choice but to "fix a decision

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[1] Organizational Manual of the National Science Foundation. NSF Manual No. 10, (Updated annually). pp. 80–82.

[2] Lomask, Milton. A Minor Miracle: An Informal History of the National Science Foundation. Washington, D.C., U.S. Govt. Print. Off., 1976, p. 227.

without consulting the Board." Every now and then, he explains, OMB would offer to back an increase in the budget of the Foundation on condition that NSF effect a specified change in its programmatic structure. As the Director soon discovered, when these opportunities arose, he had to say yes to them "in about 5 seconds" or pass up the proffered increase. The reason for this, he recalls, is that the OMB as then constituted was "a mighty impatient and dictatorial body." He says he "always would call up the Chairman of the Board . . ., informing him of what I was going to do." But was it ever possible to give the full Board an opportunity to consider an important OMB proposal? "No way!" McElroy exclaims.

It may be added that he was known now and then to express impatience with what he called the "parochial attitudes" of NSB. He was heard to say that the major contributions of some members to the deliberations of that body consisted of gripes that the scientific disciplines they represented were not getting large enough slices of the Federal pie. It is his recollection now that out in the scientific community the biologists spent a lot of time worrying over the possibility that, as one of them, he might be "leaning backwards in favor of other areas of science." [3]

Most likely in an effort to centralize his power and strengthen his control over the agency, Director McElroy established a new Office of the Assistant Director for Administration in October 1969 to integrate the administrative capabilities of the Foundation by combining the functions formerly assigned to the Comptroller, the Administrative Manager, and the Office of Data Management Systems.[4] Also, on May 4, 1970 the Director established an Executive Council. The Council consisted of the Director as Chairman, the Deputy Director, and the five Assistant Directors.[5] On July 20, 1970, the Executive Council was expanded to include the General Counsel and the Director of the Office of Government and Public Programs.[6] Subsequently as new Directorates were created, their heads were included in the membership of the Executive Council. The Council was established ". . . to serve as the key advisory body to the Director on significant planning, policy development, and program areas." [7] Often members of the Executive Council, especially the General Counsel and sometimes Assistant Directors, attend meetings of the Board's Executive Committee.

Also in 1970, in a further effort, apparently, to consolidate his control, the Director established the Management Council "to serve as a mechanism for improving staff communications, reviewing problems which involve more than one Directorate, and initiating staff work to clarify issues and develop recommended solutions to these problems." [8] The Management Council consists of the Deputy Director as Chairman, the Deputy Assistant Directors of the several directorates, the Deputy General Counsel, and the Associate Director for Public Programs of the Office of Government and Public Programs. It does not appear as if the Director consulted the Board before creating these bodies.

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[3] Ibid., p. 227–228.

NSF Manual No. 10, op. cit., p. 80.

[5] Ibid., p. 79.

[6] Ibid., p. 88.

[7] Ibid., p. 79.

[8] Ibid., p. 85.

3. Experimental R and D Incentives and Assessment Program

On May 5, 1972 the Director established the R and D Studies Group reporting to the Deputy Director. The group, established for planning purposes,[9] helped to create, on August 23, 1972, two offices reporting to the Deputy Director: the Office of Experimental R and D Incentives, to "find ways of encouraging increased investment in research and development by the civilian sector and improving and accelerating the application of R and D results," [10] and the Office of Experimental R and D Assessment, created "to find ways of encouraging increased investment in research and development by the civilian sector and improving and accelerating the application of R and D results." [11]

4. Ethical and Human Value Implications Program

On February 8, 1973 the Director created the Ethical and Human Value Implications Program to provide a focus for the NSF's role to support academic research on this topic. An NSF steering group reporting to the Director was created to provide liaison with the National Endowment for the Humanities.[12]

5. Transfer of International Scientific and Technical Activities

The international scientific and technical activities previously performed in the presidential Office of Science and Technology were transferred to the Director of the NSF on July 1, 1973. The Director announced that he would receive support for these responsibilities from the Assistant Director for National and International Programs.[13]

6. NSF Energy Council

The NSF Energy Council was established, apparently without prior Board discussion, on May 1, 1974. It reported to the Deputy Director. Its purpose was to coordinate energy-related programs in NSF and in relation to those of other agencies.[14]

7. Creation of the Office of Planning and Resources Management

Further consolidation of management occurred on June 25, 1974, when the Director created the Office of Planning and Resources Management (OPRM), reporting to him. The Office consisted originally of the Office of Budget, Programming, and Planning Analysis and the Program Review Office, transferred from the Assistant Director for Administration.[15] Subsequently, the Office was reorganized and the Audit Office functions were added.[16] Since then, the OPRM has been the major resource for personnel assigned by the Director to perform Board-related functions, especially dealing with budget, oversight, and service as executive secretaries of Board committees.[17] Mention was made in a closed session that the Director had discussed this move privately with a number of Executive Committee members prior to his announcement of it to the Executive Committee.[18]

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[9] Ibid., p. 91.
[10] Ibid., p. 95.
[11] Ibid., p. 95.
[12] Ibid., p. 95.
[13] Ibid., p. 99.
[14] Ibid., p. 99.
[15] Ibid., p. 99.
[16] Ibid., p. 103.
[17] See Appendix D
[18] ES : 166 : 27.

8. Creation of Units to Aid the Director in His Role as Science Adviser

Several actions were taken to create units to assist the Director in his role as science adviser. It seems as if the Board had virtually no role in these decisions.

a. On April 2, 1973, the Director created the NSF R and D Energy Task Force, reporting to the Deputy Director. The "purpose of the Task Force was to carry out the initial NSF staff role in the preparation of energy policy background studies and to provide staff support in energy-related matters to the Director of NSF in his role as Science Adviser to the President." [19]

b. On July 1, the Director created the Science and Technology Policy Office reporting to the Director in support of his role as science adviser to the President and as Chairman of the Federal Council for Science and Technology, pursuant to Reorganization Plan No. 1 of 1973, which took effect on July 1, 1973. NSF described the functions of the Office as being "responsible for matters of national civilian science and technology policy, developing policy options for solution of national civilian problems, appraising effectiveness of Federal and national R and D efforts, interacting with the total science community in matters of science policy, and providing advice and assistance in furthering U.S. international science and technology objectives." [20] The Board minutes indicate that the Director mentioned in the Executive Committee meeting of January 1973 that he planned to establish such an office.[21] At the same meeting, with apparently no discussion, the Executive Committee indicated agreement with this move.[22]

c. On August 3, 1973 the Director created the NSF Office of Energy R and D Policy, to report directly to him. The Office was responsible for "providing an independent source of advice and analysis of energy R and D and other energy-related programs to the Director, in support of his role as Science Adviser to the President, for use by the Executive Office of the President." [23]

9. Reorganization of NSF Directorates, 1975

A major reorganization of the NSF Directorate structure occurred in 1975. Previously the Foundation consisted of Directorates headed by four presidentially appointed directors: the Directorates for research, education, national and international programs, and research applications; and the fifth Directorate, for administrative operations, not headed by a presidentially appointed Assistant Director. On July 10, 1975, the NSF was reorganized into seven Directorates for:

> Mathematical, Physical and Engineering Sciences; Astronomical, Earth, and Ocean Sciences; Biological and Social Sciences; Science Education; Scientific, Technological, and International Affairs; Research Application; and Administration.

Detailed changes were made in each Directorate.

This reorganization seems to have been primarily a unilateral move made by the Director. Interaction with the Board took the form almost exclusively of his presenting the Executive Committee of the Board with his findings and decisions. The minutes indicate little or no

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[19] NSF Manual No. 10, op. cit., p. 95.
[20] Ibid., p. 99.
[21] ES : 152 : 3.
[22] EC : 152 : 11.
[23] NSF Manual No. 10, op. cit., p. 99.

Board discussion of the issue. However, the Board was responsible for approving the Director's slate of nominees for Assistant Directors, both presidential and non-presidential.

During the March 20, 1975 meeting of the Executive Committee, the Director spoke about tentative plans to realign certain functions of the Foundation to: (1) provide closer oversight and coordination of certain functions, especially policy, (2) remove from the Director's office all grant-making responsibilities, (3) introduce new management methods into the Foundation, and (4) resolve certain personnel problems. The Director said that he had been considering the move for some time. The minutes then report that: "Hearing no objections, the Director stated that he would move at the propitious time to implement certain reorganization recommendations." [24]

At the next Executive Committee meeting on June 18, 1975, three months later, the Director reported that an organizational study of the Foundation's structure conducted by Harbridge House and his discussions with NSF Deputy Director Atkinson convinced him of the need for a reorganization along the lines proposed. As far as NSB Executive Committee interaction went, the minutes said:

> In considering the proposed reorganization plan, Committee members asked clarifying questions and offered views on various aspects of the plan. The Committee appeared to be favorably disposed toward the plan. In conclusion the Director asked for any additional thoughts members may have on the plan.[25]

The Director mentioned his plan to the full Board in the executive session of the full Board meeting. No substantial discussion ensued.

At the Executive Committee meeting in September 1975, the Director mentioned that the reorganization was going well, and that he was consulting Board members regarding suggestions for candidates for Assistant Director slots.[26] It was announced at the November Executive Committee meeting that the Board discussed candidates and authorized the Director to present his recommendations to the Board for approval.[27]

10. Changes in Office of the Director

During 1976, several additions were made to the Office of Director: the first two were initiated in response to congressional language.

a. The Office of Small Business Research and Development was established.[28]

b. The NSF Small Business Council was established as an internal working group to assist in shaping the direction of NSF activities in small business.[29]

c. The NSB scientific support staff was created to support the Board. The Board played a major role in deciding when to create the staff and in approving the Director's choices for staff members. The 1968 legislation gave NSF authority to create its own staff, a provision not used until 1977, except for the role of executive secretary.

Following his appointment as new Director of NSF on May 3, 1977, new NSF Director Atkinson created two bodies:

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[24] ES : 171 : 24, and Executive Committee minutes 75–3.

[25] ES : 174 : 41–42, Executive Committee 75–6.

[26] ES : 175 : 20.

[27] ES : 177 : 16, Executive Committee 75–10.

[28] Section 8 of P.L. 94–471 (42 U.S.C. § 1883.)

[29] Ibid.

1. The Task Force on Geographic Distribution of NSF Awards, to develop indicators relating to the distribution of NSF awards, and
2. The Task Force on NSF–NAS Relationships, "to periodically review the long-standing relationship between the NSF and the National Academy of Sciences." [30]

On October 15, 1977, the Director transferred the Office of Audit and Oversight to his office from the Office of Planning and Resources Management, which he subsequently reorganized.[31]

11. Other Changes Mandated by Legislative and Executive Action

Legislative actions, in addition to authorizing and appropriations activities, and executive actions other than budgeting, also have had significant impact on NSF, impact which the Board has had little role in shaping. The following is a list in chronological order of major legislative enactments and executive activities which have affected the organization of NSF:

Public Law 90–407, as described in chapter II above, permitted NSF to support applied scientific research at academic and nonprofit institutions, directed NSF to support computer technology, social sciences, activities relating to international cooperation, and analysis and interpretation of data on national scientific and technical resources. It also gave NSB responsibility to recommend national policies for promotion of basic research and education in the sciences and to render an annual report.[32]

The Vice President in a letter to NSF, dated November 7, 1969, confirmed the designation of NSF as lead agency for the International Decade of Ocean Exploration and for the extension of Arctic research.[33]

Public Law 93–372, the NSF Authorization Act of 1973, in effect broadened NSF's responsibilities in science education since it amended section 3(a)(1) of the Act by inserting the words "and science education programs at all levels" after "scientific research potential." This change was made to emphasize Congress's continuing interest in and support for science education in NSF including at the precollege levels.[34] Since then, the Congress has frequently authorized funding for science education far in excess of the budgets requested by most Presidents.[35]

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[30] NSF Manual No. 10, op. cit., p. 115.

[31] Ibid., p. 119.

[32] Ibid., p. 76.

[33] Ibid., p. 72.

[34] Ibid., p. 97.

[35] For instance, in 1976, when reporting out appropriations for the fiscal year 1977, the House Committee on Appropriations, concerned that the Foundation was allocating only nine percent of its budget to science education, down from a high of about 67 percent in 1959 raised the NSF budget for science education by $9 million. The committee also recommended that these activities be made an annual account to make them more responsive to the concerns of the Congress and less subject to deferral action. The Committee also urged ". . . the Foundation to consider the establishment of minority centers for graduate education in science and engineering at minority institutions." (U.S. Congress. House. Committee on Appropriations. Department of Housing and Urban Development-Independent Agencies Appropriations Bill, 1977. June 8, 1976. House Report No. 94–1220. 94th Cong. 2d sess. Washington U.S. Govt. Print. Off., p. 30.)

More recently, when authorizing the fiscal year 1981 NSF budget, the House and Senate agreed to raise the NSF request for science education from $75.7 million to $91.2 million, giving specific directions as to program allocations within the total figure. The report also authorized NSF to expand programs for the support of minorities and women in science, directing that educational activities receive enhanced attention. $20 million of funds appropriated from the regular NSF budget was to be allocated to these activities. (U.S. Congress. Committee of Conference. National Science Foundation Authorization and Equal Opportunities in Science and Technology. Conference Report to Accompany S. 568. Nov. 21, 1980. House Report No. 96–1028, 96th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1980. p. 12, 16–29.)

Public Law 92–482, the Technology Assessment Act of 1972, authorized NSF to initiate and support specific scientific activities in connection with matters relating to "the effects of scientific applications upon society." [36]

The President's Reorganization Plan No. 1 of 1973 transferred all functions vested by law in the Office of Science and Technology to the Director of NSF; the President named the Director of NSF to be his science advisor; and later the President appointed the director of NSF as Chairman of the Federal Council for Science and Technology.[37] These functions were repealed by Public Law 94–282, the National Science and Technology Policy, Organization, and Priorities Act of 1976 (see below); however, under the latter Act, NSF became a member of the Federal Coordinating Council for Science, Engineering, and Technology.[38]

Public Law 93–409, the Solar Heating and Cooling Demonstration Act, gave NSF responsibility for applied research to improve solar heating components and for development and commercial application of solar heating and cooling systems. A few months later, Public Law 93–438, the Energy Reorganization Act transferred these functions to the Energy Research and Development Administration (ERDA).[39]

Public Law 94–282, the National Science and Technology Policy, Demonstration Act, and Public Law 93–410, the Geothermal Energy Research Development and Demonstration Act, gave NSF shared responsibility with other agencies to coordinate national programs for research, development, and demonstration of solar energy and geothermal energy. NSF's research functions in these areas were transferred to ERDA by Public Law 93–438.[40]

Public Law 94–282, the National Science and Technology, Policy, Organization, and Priorities Act of 1976, established the Office of Science and Technology Policy (OSTP) in the Executive Office of the President. The Director of the Office was directed under the act to "work in close consultation and cooperation" with several enumerated Federal entities, including the National Science Board.[41] The act also repealed the requirement that the National Science Board render an annual report to the President for submission to the Congress. This requirement was restored, in modified form by Public Law 95–99, the NSF Authorization Act for fiscal year 1978, after appeal by the National Science Board.[42]

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[36] NSF Manual No. 10, op. cit., p. 97.

[37] Ibid., p. 97.

[38] Ibid., p. 113.

[39] Ibid., p. 105.

[40] Ibid., p. 106.

[41] Ibid., p. 113.

[42] The National Science and Technology Policy, Organization, and Priorities Act of 1976 (P.L. 94–282), established an Office of Science and Technology Policy within the Executive Office of the President, similar to the Office of Science and Technology which had been abolished under Reorganization Plan No. 1 of 1973. (Public Law 94–282, May 11, 1976; 90 Stat. 459). OSTP was given the functions of (1) advising the President on national scientific and technological policy considerations, (2) evaluating and making recommendations regarding the Federal effort in science and technology, (3) advising and assisting the President and the Office of Management and Budget on the scientific, technological, and agency R&D-related considerations with regard to Federal budgets, and (4) assisting the President in providing general leadership and coordination of the research and development programs of the Federal Government. In addition, OSTP was mandated (1) to periodically survey the nature and needs of national science and technology policy and to make recommendations to the President for review and transmission to the Congress through an annual *Science and Technology Report* and (2) to prepare and annually revise a *Five-Year Outlook* report on trends, opportunities, and constraints emerging with respect to science and technology in the United States. (See National Science Foundation. Science and Technology: Annual

Footnote continued on next page.

Public Law 94–86, the NSF Authorization Act, authorized NSF to establish the Alan T. Waterman Award to recognize and encourage the work of younger scientists by awarding a medal and grant not to exceed $50,000 per year for not more than three years for research.[43] The Senate authorizing committee report instructed that the awards be made by a multidisciplinary committee appointed jointly by the Director of NSF and the Chairman of the NSB. The Committee instructed the Board to develop the actual criteria for selection of awardees, including the requirement of significant contributions to the sciences or engineering through research.[44]

Public Law 94–168, the Metric Conversion Act of 1975, required the NSF, among other agencies, to work with the U.S. Metric Board to devise public educational programs regarding conversion to the metric system.[45]

Public Law 94–158, the Arts and Artifacts Indemnity act, authorized the Federal Council on the Arts and Humanities, of which the Director of NSF is a member, to make agreements regarding idemnification against loss of art objects when on exhibit.[46]

Public Law 94–409, the Government in the Sunshine Act, required meetings, including those of the National Science Board, to be open to the public unless specifically closed for security-related reasons.[47]

Reorganization Plan No. 1 of 1977, as amended, transferred to the Director of NSF certain functions given to the Office of Science and Technology Policy. In effect, the reorganization plan transferred to

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Footnote continued from previous page.

Report to the Congress, August 1978. Washington, U.S. Govt. Print. Off., 1978. 57 p.; and National Science Foundation The Five Year Outlook: Problems, Opportunities and Constraints in Science and Technology (2 vols.), May 12, 1980. Washington, U.S. Govt. Print. Off., 1980. 787 p.) In carrying out these functions, the science policy act requires that the OSTP Director consult and cooperate with the National Science Board, as well as with certain Federal councils and the Federal agencies and departments. OSTP's assumption of national science policy responsibilities was formalized further in the 1976 Act by its repeal of those sections of Reorganization Plans No. 2 of 1962 and No. 1 of 1973 which referred to the transfer of science policy functions to and from the National Science Foundation.

The 1976 Act removed from the Board the requirement of rendering an annual report on the health and status of science, originally given to the Board by P.L. 90–407 in 1968. In the legislative history of the 1976 Act, the Board expressed its view to Congress that the statutory NSB report requirement had been "useful in providing a medium for formal communication on scientific progress and problems to the President, the Congress, and the public." However, the Board also pointed out that it 'would not interpret the repeal of this requirement to preclude our submission of reports from time to time to the President and the Congress on important scientific matters.' (Board letter sent to Rep. Olin E. Teague on Oct. 2, 1975. NSB:EC:175:24–25, Sept. 18–19, 1975). In addition to creating an OSTP the 1976 science policy Act established a President's Committee on Science and Technology (PCST) and a Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). PCST was established as a temporary body to survey, examine, and analyze the overall context of the Federal science, engineering, and technology effort. Some of the areas that PCST was directed specifically to consider were also areas addressed by the Board under its broad mandate to "recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." In particular, PCST was directed to consider needs for a broader base for support of basic research, ways of strengthening the Nation's academic institutions' capabilities for research and education in science and technology, and maintenance of adequate scientific and technological manpower. The new FCCSET also was given Federal science policy recommendation responsibilities. The new FCCSET replaced the Federal Council for Science and Technology, created by Executive Order 19807 of Mar. 13, 1959, which was transferred to the National Science Foundation subsequent to President Nixon's Reorganization Plan No. 1 of 1973 and which was abolished in 1976 under P.L. 94–282. (See U.S. Congress. Committee on Science and Technology. Subcommittee on Domestic and International Scientific Planning and Analysis. Interagency Coordination of Federal Scientific Research and Development: The Federal Council for Science and Technology. Report prepared by the Science Policy Research Division. Congressional Research Service, Library of Congress, Committee Print, 94th Cong. 2d Sess., 1976. Washington, U.S. Govt. Print. Off., 1976. p. 164 ff.)

[43] NSF manual No. 10, op. cit., p. 113.

[44] U.S. Congress. Senate. Committee on Labor and Public Welfare. National Science Foundation Authorization Act, 1976. Senate Report No. 94–111, 94th Cong., 1st sess., May 9, 1975. Washington. U.S. Govt. Print. Off., 1975. p. 23.

[45] NSF manual No. 10, op. cit., p. 113.

[46] Ibid., p. 113.

[47] Ibid., p. 116

NSF from OSTP responsibility for preparing the annual *Science and Technology Report* and the *Five-Year Outlook* report required annually.[48]

Public Law 94–471, the NSF Authorization Act for FY 1977, directed NSF to establish an Office of Small Business Research and Development to promote communications between the small business community and NSF and required the NSF to use that community in its work. The Act also required the policies promulgated by NSF and the NSB to be "within the framework of applicable policies as set forth by the President and the Congress," required the Director to consult with the Board before establishing NSB staff, and raised the grade limit for NSB professional members from GS–15 to GS–18. The NSF was required under the Act to seek qualified women, minority group members, and handicapped persons to fill executive level and other NSF positions.[49]

The conference report accompanying the authorizing legislation recommended that: (1) persons eminent in the industrial sector be included in the membership of the Board; (2) greater attention be given to Board representation by scientists whose special field is education research and by science educators from undergraduate institutions; (3) members of the Board be selected so as to provide representation from a diversity of fields and differing points of view; and (4) the National Academy of Engineering, the Sea Grant Association, the American Association of Community and Junior Colleges, and organizations which focus on the interests of minorities, women, and the handicapped be added as sources for nominations to the Board.[50]

Public Law 95–99, the NSF Authorization Act for fiscal year 1978, reinstated the requirement that NSB render an annual report, but limited now to policy issues or matters which affect NSF or with which the Board as a policymaking body for NSF, is concerned, increased the rate of compensation of Board members to the daily rate for a GS–18, and changed the wording of section 3 (e) from "one of the objectives" to "an objective" of the Foundation is "to strengthen research and education in the sciences . . . and to avoid undue [geographical] concentration of research and education; and required NSF staff dealing with award of funds to submit financial disclosure statements."[51]

Public Law 95–367, the National Climate Program Act, required the President to promulgate a five-year plan for climate research and to define the roles of Federal agencies, including NSF, in that plan.[52]

Public Law 95–124, the Earthquake Hazards Reduction Act of 1977, directed the President to establish a coordinated earthquake hazards reduction program and to designate appropriate roles for Federal agencies, including the NSF.[53]

Public Law 95–541, the Antarctic Conservation Act of 1978, prohibited U.S. citizens from removing or bringing into Antarctica any plants or pollutants and gave the Director of NSF authority to issue implementing regulations and permits authorizing activities otherwise prohibited by the Act.

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[48] Ibid., p. 116.

[49] Ibid., p. 116.

[50] U.S. Congress. Conference Committees, 1976. National Science Foundation Authorization for Fiscal Year 1977; conference report to accompany H.R. 12566. House. Report No. 94–1689. 94th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1976. p. 15–16.

[51] NSF manual No. 10, op. cit., pp. 116, 117.

[52] Ibid., p. 122.

[53] Ibid., p. 122.

Public Law 95–592, the Native Latex Commercialization and Economic Development Act of 1978, gave the Departments of Commerce and Agriculture lead agency responsibility for research, development, and demonstration relating to culturing and manufacturing native latex plants, particularly guayule, and required these departments to coordinate activities with the National Science Foundation.

Public Law 95–434, the NSF Authorization Act for 1979, authorized NSF's Director to determine the need to support a study of the feasibility of transmitting solar energy to earth by use of orbital structures manufactured from lunar or asteroidal materials.

Public Law 96–516, the NSF Authorization and Science and Technology Equal Opportunities Act (1980), addressed representation of women and minorities on the National Science Board.[54] The Act amended section 4(c) of the NSF organic act to require that, in making nominations for Board membership, the President "shall give due regard to equitable representation of scientists who are women or who represent minority groups." This new requirement was formulated by the Senate Committee on Labor and Human Resources to "assure that the National Science Board will continue to be a broadly representative and balanced advisory body" in light of the committee's finding that "scientists with one or both of these backgrounds are currently severely underrepresented in the U.S. scientific personnel pool" and the committee's concern that "such underrepresentation not be reflected in the Science Board." [55]

It also established that it is "the policy of the United States to encourage men and women, equally, of all ethnic, racial, and economic backgrounds to acquire skills in science and mathematics, and to have equal opportunity in education, training, and employment in scientific and technical fields. The Act authorized the NSF to undertake research to increase understanding of the potential contribution of women in science and technology, to make National Research Opportunity Grants to postdoctoral women scientists, to support visiting professorships for women in science, to continue and expand the NSF program for minorities, to establish a comprehensive national policy for equal opportunity in science and technology, to request the Director to establish a Committee on Equal Opportunities in Science and Technology, and to make a variety of reports on these topics.[56]

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[54] P.L. 96–516, Dec. 12, 1980.

[55] U.S. Congress. Senate. Committee on Labor and Human Resources. National Science Foundation and Women in Science Authorization Act for Fiscal Years 1981 and 1982; report to accompany S. 568. Senate Report No. 96–713, 96th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1980. p. 31.

[56] U.S. Congress. Committee of Conference. National Science Foundation Authorization and Equal Opportunities in Science and Technology. Conference Report to accompany 568. House Report No. 96–1474, 96th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1980.

APPENDIX Q

FORMER MEMBERS OF THE NATIONAL SCIENCE BOARD

FORMER MEMBERS
NATIONAL SCIENCE BOARD

Name, Affiliation#	*Term of Service*
Aberle, Dr. Sophie B.,* Special Research Director, The University of New Mexico	1950-58
Adams, Dr. Roger,† Research Professor, Department of Chemistry and Chemical Engineering, University of Illinois	1954-60
Atkinson, Dr. Richard C., Director, National Science Foundation	1977-80
Baker, Dr. W. O., Vice President-Research, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey	1960-66
Barnard, Dr. Chester I.,*† President, The Rockefeller Foundation, New York, New York	1950-56
Barnes, Dr. Robert P.,* Professor of Chemistry, Howard University	1950-58
Bing, Dr R. H., Rudolph E. Langer Professor of Mathematics, The University of Wisconsin	1968-74
Bronk, Dr. Detlev W.,*†President, The Rockefeller University	1950-64
Brooks, Dr. Harvey, Gordon McKay Professor of Applied Physics and Dean of Engineering and Applied Physics, Harvard University	1962-74
Bunting, Dr. Mary I., President, Radcliffe College	1965-70
Campbell, Dr. W. Glenn, Director, Hoover Institution on War, Revolution, and Peace, Stanford University	1972-78

#Positions when appointed to NSB or major affiliation during service on NSB.
*Charter Members
†Deceased.

Name, Affiliation	*Term of Service*
Carter, Dr. H. E., Vice Chancellor for Academic Affairs, University of Illinois, and Coordinator of Interdisciplinary Programs, University of Arizona	1964-76
Charpie, Dr. Robert A., President, Cabot Corporation, Boston, Massachusetts	1970-76
Clement, Dr. Rufus E.,† President, Atlanta University	1960-67
Cobb, Dr. Jewel Plummer, Dean and Professor of Biology, Douglass College, Rutgers—The State University of New Jersey	1974-80
Conant, Dr. James B.,*† President, Harvard University	1950-53
Cori, Dr. Gerty T.,*† Professor, Biological Chemistry, School of Medicine, Washington University	1950-57
Davis, Dr. John W.,*† President, West Virginia State College	1950-56
Dicke, Dr. Robert H., Albert Einstein Professor of Science, Department of Physics, Princeton University	1970-76
Dollard, Mr. Charles,*† President, Carnegie Corporation of New York, New York, New York	1950-58
DuBridge, Dr. Lee A.,* President, California Institute of Technology	1950-54 1958-64
Elvehjem, Dr. Conrad A.,† President, The University of Wisconsin	1960-62
Eyring, Dr. Henry, Dean, Graduate School, University of Utah	1962-68
Fowler, Dr. William A., Institute Professor of Physics, California Institute of Technology	1968-74

Name, Affiliation	*Term of Service*
Fred, Dr. Edwin B.,* President, The University of Wisconsin	1950-56
Gates, Dr. David M., Professor of Botany and Director, Biological Station, Department of Botany, University of Michigan	1970-76
Glennan, Dr. T. Keith, President, Case University	1956-58
Goldsmith, Dr. Julian R., Associate Dean, Division of the Physical Sciences, The University of Chicago	1964-70
Gould, Dr. Laurence M., President, Carleton College	1953-62
Gross, Dr. Paul M.,* Vice President, Duke University	1950-62
Hackerman, Dr. Norman, President, Rice University	1968-80
Hagerty, Dr. William W., President, Drexel Institute of Technology	1964-70
Hahn, Dr. T. Marshall, Jr., President, Georgia-Pacific Corporation, Portland, Oregon	1972-78
Handler, Dr. Philip, James B. Duke Professor and Chairman, Department of Biochemistry, Duke University, and President, National Academy of Sciences	1962-74
Hardin, Dr. Clifford M., Chancellor, University of Nebraska, and Secretary of Agriculture	1966-70
Harrison, Dr. Anna J., William R. Kenan, Jr., Professor of Chemistry, Mount Holyoke College	1972-78
Haworth, Dr. Leland J.,† Director, National Science Foundation	1963-69
Heffner, Dr. Hubert,† Chairman, Department of Applied Physics, Stanford University	1972-75
Hesburgh, The Very Rev. Theodore M., C.S.C., President, University of Notre Dame	1954-66

Name, Affiliation	*Term of Service*
Heyns, Dr. Roger W., Chancellor, University of California, Berkeley, and President, American Council on Education	1967-76
Houston, Dr. William W.,† Honorary Chancellor, William Marsh Rice University	1954-66
Hubbard, Dr. W. N., Jr., President, The Upjohn Company, Kalamazoo, Michigan	1974-80
Humphrey, Dr. George D.,*† President, The University of Wyoming	1950-62
Hyman, Dr. O. W.,*† Dean of Medical School and Vice President, The University of Tennessee	1950-56
Jones, Dr. Charles F., President, Humble Oil & Refining Company Houston, Texas	1966-72
Jones, Dr. Thomas F., Jr., President, University of South Carolina	1966-72
Loeb, Dr. Robert F.,*† Bard Professor of Medicine, College of Physicians and Surgeons, Columbia University	1950-64
Mac Lane, Dr. Saunders, Max Mason Distinguished Service Professor of Mathematics, University of Chicago	1974-80
Macelwane, The Rev. James B., S.J.,† Dean, Institute of Technology, St. Louis University	1954-56
March, Dr. James G., David Jacks Professor of Higher Education, Political Science, and Sociology, School of Education, Stanford University	1968-74
McBride, Dr. Katharine E.,† President, Bryn Mawr College	1962-68
McCann, Dr. Kevin, President, The Defiance College	1958-64
McElroy, Dr. William D., Director, National Science Foundation	1969-72
McLaughlin, Dr. Donald H.,* President, Homestake Mining Company, San Francisco, California	1950-60

Name, Affiliation	*Term of Service*
McShane, Dr. Edward J., Professor of Mathematics, University of Virginia	1956-68
Meckling, Dean William H., Dean, The Graduate School of Management, The University of Rochester	1972-78
Merck, Mr. George W.,† Chairman of the Board, Merck & Company, Inc., New York, New York	1951-57
Middlebush, Dr. Frederick A.,*† President, University of Missouri	1950-62
Moreland, Mr. Edward L.,*† Executive Vice President, Massachusetts Institute of Technology	1950-51
Morison, Dr. Robert S., Professor of Biology and Director, Division of Biological Sciences, Cornell University	1963-72
Morris, Dr. Joseph C.,*† Vice President, Tulane University	1950-66
Morse, Dr. Marston,*† Professor of Mathematics, The Institute for Advanced Study	1950-54
Murray, Dr. Grover E., President and University Professor, Texas Tech University and School of Medicine	1968-80
Nabrit, Dr. Samuel M., President, Texas Southern University	1956-59
Nierenberg, Dr. William A., Director, Scripps Institution of Oceanography, University of California, San Diego	1972-78
O'Brien, Dr. Morrough P., Dean, College of Engineering, University of California, Berkeley	1958-60
O'Neal, Dr. Russell D., Chairman and Chief Executive Officer, KMS Industries, Inc., Ann Arbor, Michigan	1972-78
Picker, Dr. Harvey, Chairman of the Board, Picker Corporation, White Plains, New York	1965-70

Name, Affiliation	*Term of Service*
Piore, Dr. E. R., Vice President and Chief Scientist, International Business Machines Corporation, Armonk, New York	1961-72
Potter, Dr. A. A.,*† Dean of Engineering, Purdue University	1950-58
Press, Dr. Frank, Chairman, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology	1970-76
Rees, Dr. Mina S., President, The Graduate Division, The City University of New York	1964-70
Reyniers, Dr. James A.,*† Director, LOBUND Institute, University of Notre Dame	1950-54
Reynolds, Dr. Joseph M., Boyd Professor of Physics and Vice President for Instruction and Research, Louisiana State University	1966-78
Rubey, Dr. William W.,† Professor of Biology and Geophysics, University of California, Los Angeles	1960-66
Russell, Dr. Jane A.,† Associate Professor of Biochemistry, Emory University	1958-64
Seaborg, Dr. Glenn T., Chancellor, University of California at Berkeley	1960-61
Sears, Dr. Paul B., Chairman, Conservation Program, Yale University	1958-64
Shields, Dr. L. Donald, President, California State University at Fullerton	1974-80
Smith, Dr. Frederick E., Professor of Advanced Environmental Studies in Resources and Ecology, Graduate School of Design, Harvard University	1968-74

Name, Affiliation	*Term of Service*
Snyder, Mr. John I., Jr.,† Chairman of the Board and President, U.S. Industries, Inc., New York, New York	1964-65
Spilhaus, Dr. Athelstan F., Professor of Physics, University of Minnesota, and President, The Franklin Institute	1966-72
Stakman, Dr. E. C.,*† Chief, Division of Plant Pathology and Botany, University of Minnesota	1950-54
Stevenson, Dr. Earl P., President and Chairman of the Board, Arthur D. Little, Inc., Cambridge, Massachusetts	1951-56
Stever, Dr. H. Guyford, President, Carnegie-Mellon University, and Director, National Science Foundation	1970-72 1972-76
Stratton, Dr. Julius A., President, Massachusetts Institute of Technology	1956-62 1964-67
Sullivan, Mr. Richard H., President, Association of American Colleges	1966-72
Tatum, Dr. Edward L.,† Professor of Microbiology and Biochemistry, The Rockefeller University	1956-68
Thieme, Dr. F. P., Executive Vice President, University of Washington, and President, University of Colorado	1964-76
Tyler, Dr. Ralph W., Director, Center for Advanced Study in the Behavioral Sciences, Stanford, California	1962-68
Volwiler, Dr. Ernest H., President and Chairman of the Board, Abbott Laboratories, North Chicago, Illinois	1958-64
Walker, Dr. Eric A., President, The Pennsylvania State University	1960-66
Waterman, Dr. Alan T.,† Director, National Science Foundation	1950-63
Weaver, Dr. Warren,† Vice President for the Natural and Medical Sciences, The Rockefeller Foundation	1956-60
Whitaker, Dr. Douglas M.,† Vice President for Administration, The Rockefeller University	1954-60
Willey, Dr. Malcolm M.,† Vice President, Academic Administration, University of Minnesota	1960-64
Wilson, Mr. Charles E.,*† President, General Electric Company, Schenectady, New York	1950-51
Yancey, The Rev. Patrick H., S.J., *† Chairman, Department of Biology, Spring Hill College	1950-54
Zumberge, Dr. James H., President, Southern Methodist University	1974-80

APPENDIX R

CHRONOLOGICAL SUMMARY OF NATIONAL SCIENCE BOARD MEMBERS

CHRONOLOGICAL SUMMARY OF NATIONAL SCIENCE BOARD MEMBERS, SHOWING "VICE MEMBERS"

May 10 1950-1952	1952-1954	1954-1956	1956-1958	1958-1960	1960-1962	1962-1964	1964-1966	1966-1968	1968-1970	1970-1972	1972-1974	1974-1976	1976-1978	1978-1980	1980-1982	1982-1984	1984-1986
ABERLE	*	*	*	McCANN	*	*	SNYDER PICKER	*	*	PRESS	*	*	RICH	*	*	---	---
BARNARD	*	*	GLENNAN	* Until 10/58 XX	WILLEY	*	THIEME	*	*	*	*	*	HUEG	*	*	---	---
BARNES	*	*	*	VOLWILER	*	*	XX BUNTING Start 5/65	*	*	GATES	*	*	KOSHLAND	*	*	---	---
BRONK	*	*	*	*	*	*	CARTER	*	*	*	*	*	BISPLINGHOFF	*	*	---	---
CORI	*	*	* Until 10/57 XX	RUSSELL	*	*	REES	*	*	DICKE	*	*	XX PETTIT Start 1/78	*	*	---	* ---
DOLLARD	*	*	*	SEARS	*	*	GOLDSMITH	*	*	CHARPIE	*	*	DOAN	*	*	---	---
LOEB	*	*	*	*	*	*	HAGERTY	*	*	COOKE	*	*	*	*	*	---	---
POTTER	*	*	*	DuBRIDGE	*	*	STRATTON	STRATTON HEYNS	*	*	*	*	HOGNESS	*	*	---	---
DuBRIDGE	*	HOUSTON	*	*	*	*	*	C.F. JONES	*	*	HAHN	*	*	XX MASSEY Start 5/79	*	**	---
[illegible]	*	*	*	*	RUBEY	*	*	REYNOLDS	*	*	*	*	*	XX RAGONE Start 5/79	*	**	---
MORELAND MERCK	*	*	* Until 10/57 XX	O'BRIEN	WALKER	*	*	T.F. JONES	*	*	CAMPBELL	*	*	XX FRIEDL Start 5/79	*	**	---
MORRIS	*	*	*	*	*	*	*	SULLIVAN	*	*	NIERENBERG	*	*	XX SALPETER Start 5/79	*	**	---
MORSE	*	ADAMS	*	*	SEABORG PIORE	*	*	*	*	*	MECKLING	*	*	XX COTA-ROBLES Start 5/79	*	**	---
REYNIERS	*	HESBURGH	*	*	*	*	*	SPILHAUS	*	*	HEFFNER	HEFFNER SLICHTER	*	*	*	**	---
STAKMAN	*	WHITAKER	*	*	ELVEHJEM	XX MORISON Start 11/63	*	*	*	*	O'NEAL	*	*	XX BRANSCOMB Start 5/79	*	**	---
YANCEY	*	MACELWANE	WEAVER	*	BAKER	*	*	HARDIN	*	STEVER	HARRISON	*	*	XX KASHA Start 5/79	*	**	---
CONANT	CONANT GOULD	*	*	*	*	EYRING	*	*	SMITH	*	*	COBB	*	*	OSBORN	**	**
DAVIS	*	*	McSHANE	*	*	*	*	*	FOWLER	*	*	SHIELDS	*	*	GOOD	**	**
FRED	*	*	BABBIT	* Until 7/59 XX	CLEMENT	*	*	* Until 11/67 XX	HACKERMAN	*	*	*	*	*	RICE	**	**
GROSS	*	*	*	*	*	HANDLER	*	*	*	*	*	HUBBARD	*	*	NEAL	**	**
HUMPHREY	*	*	*	*	*	McBRIDE	*	*	BING	*	*	MAC LANE	*	*	LAX	**	**
HYMAN	*	*	STRATTON	*	*	BROOKS	*	*	*	*	*	D. RICE	*	*	*	**	**
MIDDLEBUSH	*	*	*	*	*	TYLER	*	*	MARCH	*	*	ZUMBERGE	*	*	XX XX	XX XX	---
WILSON STEVENSON	*	*	TATUM	*	*	*	*	*	MURRAY	*	*	*	*	*	FLAWN	**	**
WATERMAN	*	*	*	*	*	WATERMAN HAWORTH	*	*	HAWORTH McELROY	*	STEVER	*	STEVER ATKINSON	*	SLAUGHTER	**	**

__/ Note: The selection of new members is made keeping in mind the need to maintain a balance of membership characteristics, such as geographic distribution, discipline, experience, and so forth. As a result, new members are designated to replace specific predecessors. The Board uses the term "vice [name of member retiring]" to describe this process.

*	Continued term
**	Term is expected to continue
XX	Vacancy
Dir.	This row designates NSF directors, who are ex officio members of the National Science Board

APPENDIX S

GEOGRAPHICAL REPRESENTATION OF PRESENT AND FORMER NSB MEMBERS

February 1981

GEOGRAPHIC REPRESENTATION OF PRESENT AND FORMER
NATIONAL SCIENCE BOARD MEMBERS
(Residences during Tenure on Board) _/

Present	Former
Alabama	
	*Yancey
Arizona	
	Carter (appointed from Illinois)
California	
Koshland (82)	Campbell
Rice, Jr., Donald B. (86)	DuBridge
Cota-Robles (84)	Fowler
	*Heffner
	March
	McLaughlin
	Nierenberg
	O'Brien
	*Rubey (appointed from Maryland)
	Shields
	Thieme (appointed from Washington)
Colorado	
Connecticut	
Osborn (86)	*Weaver
District of Columbia	
	Atkinson (former Director, appointed from California)
	Barnes
	Handler (appointed from North Carolina)
	Heyns (appointed from California)
	McElroy (former Director, appointed from Maryland)
	Seaborg (appointed from California)
	Spilhaus (appointed from Minnesota)
	Stever (former Director, appointed from Pennsylvania)
	*Waterman (former Director)
Florida	
Kasha (84)	
Georgia	
Pettit (82)	*Clement
	*Russell

Present	Former
Illinois	
Massey (84) (appointed from Rhode Island) Slichter (84) Stuart A. (86)	*Adams Goldsmith Mac Lane Tyler (appointed from California) Volwiler
Indiana	
Neal (86)	Hesburgh Potter *Reyniers
Louisiana	
Good (86)	*Morris Reynolds
Maryland	
Slaughter (Director, appointed from Washington)	Sullivan (appointed from Oregon)
Massachusetts	
Rich (82) Bisplinghoff (82) (appointed from Missouri)	Brooks Bunting Charpie *Conant Harrison *Moreland Press Stevenson
Michigan	
Doan (82) Ragone (84)	Gates (appointed from Missouri) Hubbard O'Neal
Minnesota	
Hueg (82)	Gould (now resides in Arizona) *Stakman *Willey
Missouri	
	*Cori *Macelwane *Middlebush
Nebraska	
	Hardin
New Hampshire	
	Sears (now resides in New Mexico)

Present	Former
New Jersey	
	Baker Cobb (appointed from Connecticut) Davis (appointed from West Virginia) Dicke *Merck *Morse
New Mexico	
	Aberle
New York	
Branscomb (84) Cooke (82) (appointed from Illinois) Lax (86) Salpeter (84)	*Barnard *Haworth (former Director) *Loeb Meckling Morison Picker Piore Rees *Snyder Stratton (appointed from Massachusetts) *Tatum (appointed from California) *Whitaker (appointed from California) *Wilson
North Carolina	
Friedl (84)	Gross
Ohio	
	Glennan McCann
Oregon	
	Hahn (appointed from Virginia)
Pennsylvania	
	*Bronk Hagerty *McBride Walker

Present	Former
Rhode Island	
	Smith (appointed from Michigan)
South Carolina	
	Thomas F. Jones, Jr. (now resides in Massachusetts)
Tennessee	
	*Hyman
Texas	
Flawn (86)	Bing (appointed from Wisconsin)
	Hackerman
	*Houston
	Jones, Charles F.
	Murray
	Nabrit
	Zumberge (appointed from Arizona)
Utah	
	Eyring
Vermont	
	Dollard (appointed from New York)
Virginia	
	McShane
Washington	
Hogness (82)	
Wisconsin	
	*Elvehjem
	Fred
Wyoming	
	*Humphrey

APPENDIX T

WOMEN WHO HAVE SERVED AS MEMBERS OF THE NATIONAL SCIENCE BOARD

February 1981

WOMEN WHO HAVE SERVED AS MEMBERS OF THE NATIONAL SCIENCE BOARD

Dr. Sophie B. Aberle Special Research Director The University of New Mexico	1950-58
Dr. Gerty T. Cori* Professor, Biological Chemistry School of Medicine Washington University	1950-57
Dr. Jane A. Russell* Associate Professor of Biochemistry Emory University	1958-64
Dr. Katherine E. McBride* President Bryn Mawr College	1962-64
Dr. Mina S. Rees President The Graduate Division The City University of New York	1964-70
Dr. Mary I. Bunting President Radcliffe College	1965-70
Dr. Anna J. Harrison William R. Kenan, Jr., Professor of Chemistry Mount Holyoke College	1972-78
Dr. Jewell Plummer Cobb Dean and Professor of Biology Douglass College Rutgers, The State University of New Jersey	1974-80
Dr. Marian E. Koshland Professor of Bacteriology and Immunology University of California at Berkeley	1976-82

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* Deceased

Dr. Ernestine Friedl Dean of Arts and Sciences and Trinity College and Professor of Anthropology Duke University	1978-84
Dr. Mary L. Good Vice President and Director of Research UOP, Inc.	1980-86
Dr. Mary Jane Osborn Professor and Head Department of Microbiology School of Medicine University of Connecticut	1980-86

There was a hiatus from 1970 to 1972 when no women served on the Board.

APPENDIX U

MINORITIES WHO HAVE SERVED AS NSB MEMBERS

March 1980

MEMBERS OF MINORITY RACES WHO HAVE SERVED AS MEMBERS OF THE NATIONAL SCIENCE BOARD

Dr. John W. Davis President West Virginia State College	1950-56
Dr. Robert P. Barnes Professor of Chemistry Howard University	1950-58
Dr. Samuel M. Nabrit President Texas Southern University	1956-59
Dr. Rufus E. Clement* President Atlanta University	1960-67
Dr. Lloyd M. Cooke Vice Chairman Economic Development Council of New York City	1970-82
Dr. Jewel Plummer Cobb Dean and Professor of Biology Douglass College Rutgers--The State University of New Jersey	1974-80
Dr. Eugene H. Cota-Robles Professor of Biology University of California at Santa Cruz	1978-84
Dr. Walter E. Massey Director Argonne National Laboratory	1978-84
Dr. Homer A. Neal Dean of Research and Graduate Development, and Professor of Physics Indiana University	1980-86

There was a period from 1967 to 1970 when no minority members served on the Board.

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* Deceased

APPENDIX V

NSB INTERACTION WITH ADVISORY COMMITTEES, JANUARY 1975 TO MID-1980

NSB INTERACTION WITH ADVISORY COMMITTEES, January 1975 to March 1980 1/

Reports of Meetings Scheduled or Confirmed as Held, with Dates and Number of NSB Members in Attendance

(Note: the Board usually schedules attendance or seeks attendance of NSB members at advisory committee meetings one or two NSB meetings in advance of the scheduled advisory committee meeting. Sometimes NSB members scheduled to attend do not attend the meeting, no members elect to attend, or the meeting is cancelled. Column one in this list, titled "Meeting first discussed at meeting number" indicates the first time the meeting was mentioned in the NSB minutes.

Meeting First Discussed at Meeting Number:	Meeting Scheduled or Reported	Number of NSB Members:	
		Scheduled to Attend	In Attendance (Followed by NSB meeting Number At Which Attendance Was Reported, if Number Changed, and if Known)
169	Report to Full NSB by Chair and Vice-chair of Advisory Comm. for Science Education, June 17, 1975	Full NSB	
171	Advisory Comm. for Science Education, Mar. 6-7, 1975	3	
173	Advisory Comm. for Science Education, May 9-10, 1975	2	
	Report of Science Curriculum Review Group, May 9-10, 1975	Full NSB	
	Advisory Comm. for Science Education, July 17-18, 1975	N.A.	Cancelled
175	Advisory Comm. on Ethical and Human Value Implications of Science and Technology, Oct. 8, 1975	2	2 (Meeting 176)
177	Advisory Comm. for Research, Nov. 6-7, 1975	2	
	Advisory Comm. for Science Education, Nov. 6-7, 1975	4	
	Advisory Comm. for Research Applications Policy, Nov. 18-19, 1975	1	

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members Scheduled:	In Attendance:
178	Advisory Committee for Science Education, Jan. 5-6, 1976	4	
	Annual Report of Advisory Comm. for Science Education delivered by chair of Advisory Comm.	Full NSB	
	Annual Report of Advisory Comm. for Research delivered by chair of Advisory Comm.	Full NSB	
179	Advisory Comm. for Research, Apr. 1-2, 1976	3	Cancelled
182	Advisory Comm. for Research Applications Policy, June 8-9, 1976	2	
183	Advisory Comm. for Science Education, July 15-16, 1976	3	1
	Advisory Comm. for Research Applications, Oct. 20-21, 1976	N.A.	Cancelled
185	Advisory Comm. on Ethical and Human Value Implications of Science and Technology, Oct. 1, 1976	N.A.	0
186	Advisory Comm. for Research, Oct. 21-22, 1976	2	
	Advisory Comm. for Science Education, Nov. 11-12, 1976	1	
	Advisory Comm. for Research Applications Policy, Dec. 7-8, 1976	2	2 (Meeting 187)
187	Science Applications Task Force, Jan. 6-7, 1977	N.A.	1
	Science Information Activities Task Force, Jan. 13-14, 1977	1	
	Science Applications Task Force, Feb. 21-22, 1977	N.A.	0 (Meeting 187)
	Advisory Comm. for Research/NSF Advisory Council, Jan 14-15, 1977	N.A.	Rescheduled
188	Science Information Activities Task Force, Mar. 7-8, 1977	1	

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members	
		Scheduled:	In Attendance:
	Advisory Comm. for Science Education, Mar. 10-11, 1977	1	
	Advisory Comm. for Science Education, July 7-8, 1977	N.A.	
	Advisory Comm. for Science Education, Report by Chairman of Advisory Comm., Mar. 17, 1977		Full NSB (Meeting 188)
189	Science Applications Task Force, Mar. 30-31, 1977	1	0
	Advisory Comm. for Minority Programs in Science Education, Mar. 21-22, 1977	1	
	Advisory Comm. for Research/ NSF Advisory Council, Apr. 14-15, 1977	4	
	Advisory Comm. for Research Applications, Apr. 18-19, 1977	2	
	Annual Reports by Chairman of:		
	Advisory Comm. for Research Applications, Apr. 21, 1977	Full NSB	
	Science Applications Task Force, Apr. 21, 1977	Full NSB	
	Advisory Comm. for Research, Apr. 21, 1977	Full NSB	
190	Science Information Activities Task Force, Apr. 25-26, 1977	1	
	Science Applications Task Force, May 2-3, 1977	1	
191	Science Applications Task Force May 23-24, 1977	N.A.	0
	Science Applications Task Force, June 20-21, 1977	N.A.	1

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members Scheduled:	In Attendance:
	Advisory Comm. for Minority Programs in Science Education, June 2-3, 1977	N.A.	0
	Science Information Activities Task Force, June 9-10, 1977	2	
	Advisory Comm. on Ethics and Values in Science and Technology, June 3, 1977	N.A.	0
192	Science Applications Task Force, June 9-10, 1977 (rescheduled to July 26-27)	1	
	Advisory Comm. for Science Education, July 7-8, 1977	2	
	Science Information Activitites Task Force, July 28-29, 1977	1	
	Advisory Comm. for Science for Citizens, Sept. 15-16, 1977	N.A.	0, but Director transmitted report to NSB
193	Advisory Comm. for Minority Programs in Science Education, Sept. 1-2, 1977		
	Science Information Activities Task Force, Sept. 15, 1977, Report by Task Force Chairman	Full NSB	
194	NSF Advisory Council, Nov. 3-4, 1977	1	2
	Advisory Comm. for Science Education, Nov. 10-11, 1977	2	1
	Research Initiation and Support Project Directors' Meeting, Oct. 21, 1977	1	
	Minority Institutions and Science Improvement Program Project Directors' Meeting, Nov. 17, 1977	1	

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members	
		Scheduled:	In Attendance:
	Advisory Comm. for Minority Programs in Science Education, Dec. 8-9, 1977	1	
196	Advisory Comm. for Science Education, Feb. 2-3, 1978	2	
197	NSF Advisory Council, Apr. 13-14, 1978	3	
198	Advisory Comm. for Applied Science and Research Applications Policy, Apr. 26-27, 1978	3	
	Advisory Comm. for Science Education, May 4-5, 1978	3	2
	Attendance at SSRC Review of Science Indicators, May 12-13, 1978	2	1
199	NSF Small Business Conference on Federal R and D, May 22-23 1978	2	
202	Advisory Comm. for Science Education, Sept. 28-29, 1978	1	1 (Meeting 203)
	NSF Advsiory Council, Oct. 26-27, 1978	1	
	Advisory Comm. for Applied Science and Reserch Applications Policy, Nov. 29-30, 1978	2	
203	Curriculum Exchange Conference for Minority Insitutions, Jan. 19-20, 1979	N.A.	1 consultant (Meeting 205)
204	Annual presentation of Joint Oceanographic Instituions/Deep Sea Drilling Project, Apr. 2, 1978	2	
205	Advisory Comm. for Science Education, Feb. 1-2, 1979	1 1 consultant	
	Advisory Comm. for Information Science and Technology, Feb. 22-23, 1978	N.A.	0

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members Scheduled:	In Attendance:
	Advisory Comm. on Science and Society, Mar. 9-10, 1979	1	
206	NSF Advisory Council, May 8-9, 1979	1	2
	Advisory Comm. for Policy Research and Analysis and Science Resources Studies, May 10-11, 1979	1	
	Advisory Comm. for Information Science and Technology, Aug. 9-10, 1979	N.A.	Cancelled
207	Advisory Comm. for International Programs, May 18, 1979	1	
	Advisory Comm. for Science Education, Sept. 27-28, 1979	2	1 (Meeting 210)
208	Advisory Comm. for Science and Society, July 12-13, 1979	3	2
	Subcomm. on Millimeter-wave Facilities of the Advisory Comm. for Astronomy, July 16-17, 1979	1	
209	Engineering and Applied Science Small Business Conference on R and D, Sept. 6-7, 1979	2	
	Sept. 13-14, 1979	1	
210	Advisory Comm. for Information Science and Technology, Oct. 11-12, 1979	1	
	NSF Advsiory Council, Nov. 1-2, 1979	1	3 (Meeting 211)
	Advisory Comm. on Policy Research and Analysis and Science Resources Studies,. Nov. 8-9, 1979	1	Rescheduled to Jan. 24-25, 1980 2 (Meeting 212)

First Discussed At:	Meeting Scheduled or Reported	Number of NSB Members Scheduled:	In Attendance:
211	Advisory Comm. for Science and Society, Nov. 19-20, 1979	1	
	Advisory Comm. for Science Education, Feb. 14-15, 1980	1	
213	Advisory Comm. for Engineering and Applied Sciences, Jan. 24-25, 1980	1	
215	Advisory Comm. on Science and Society, Mar. 5-6, 1980	2	

1 / Compiled from NSB data.

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APPENDIX W

7.
NSB-76-199

NATIONAL SCIENCE FOUNDATION
NATIONAL SCIENCE BOARD
Washington, D.C. 20550

June 11, 1976

MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

Subject: Hoff Report

At the Director's request, Mr. William J. Hoff, former NSF General Counsel, has prepared a report containing the historical record of the relationship and role of the Board and the Director and recommendations for certain operational changes. This report is timely and thoughtful and is being sent to you now in the hope that you will have time to read it before the Board meeting.

Vernice Anderson
Executive Secretary

Attachment

2402 Wyoming Avenue, N. W.
Washington, D. C. 20008

May 28, 1976

Dr. Norman Hackerman
Chairman
National Science Board
Washington, D. C. 20550

Re: Order No. 76-SP-0671

Dear Dr. Hackerman:

There is submitted herewith a report, "The National Science Foundation -- Board and Director," prepared in response to the above referenced order.

It is my hope that you may find the history sketched therein and the suggestions made of some use to the Board in its deliberations.

Very sincerely yours,

William J. Hoff

William J. Hoff

Enclosure

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The National Science Foundation: Board and Director

A Study Prepared for the
National Science Foundation
by
William J. Hoff

May 28, 1976

THE NATIONAL SCIENCE FOUNDATION--BOARD AND DIRECTOR

I. The Development of the Responsibilities of the Board and the Director

A. Enactment of the National Science Foundation Act of 1950.

The genesis of the National Science Foundation can of course be traced back to the Office of Scientific Research & Development (OSRD). It had its first abortive legislative ancestry in the Kilgore bills of 1942, 1943, and 1944. It was only in 1944, after an approach by Oscar Cox (then General Counsel to the Lend-Lease Administration) to Harry Hopkins resulted in a letter from President Roosevelt to Vannevar Bush requesting his thoughts on a program to foster science, that the idea of the Federal Government taking a permanent role in support of science began to acquire substance. The ensuing Bush report entitled "Science: The Endless Frontier," calling for the creation of a National Research Foundation, was released to the public by President Truman on July 19, 1945. On the same day Senator Magnuson introduced S. 1285, a bill drafted by OSRD. For the purposes of this report the most significant difference between the Kilgore and Magnuson bills was that the former provided for an Administrator appointed by the President and relegated the Board to a purely advisory function, while the latter, closely reflecting the "science establishment" viewpoint, vested power in a Presidentially appointed Board which was to appoint and be responsible for the chief executive officer.

This fundamental difference was at the heart of the debates which occurred intermittently in the Congress over the next five years. During this period President Truman pocket-vetoed a bill sponsored by Senator Alexander Smith (S. 526) in the summer of 1947. Although not required to state his reasons, the President in an explanatory memorandum accompanying his disapproval of the bill, stated that the organization provided by the Smith bill violated basic principles of government responsibility in that an organization destined to dispense large amounts of federal funds would not really be subject to Presidential control. He held that the chief executive officer must be appointed by the President and be responsible to him, not to the Board. At the same time he reaffirmed his strong wish that a suitable organization be established.

After further efforts and debates the National Science Foundation Act of 1950 finally came into being on May 10th of that year. The divergent philosophies of independence for the scientific community as represented by placing full powers in the Board and Presidential responsibility for the expenditure of public funds resulted in a unique form of organization largely dependent on good will, cooperation and accommodation of differences between the Board and the Director.

B. Distribution of Authority Between the Board and the Director Under the National Science Foundation Act of 1950.

The dual nature of the distribution of authority in the organization has always been encapsulated in the statute in the phrase, "The Foundation shall consist of a National Science Board . . . and a Director." However, the precise distribution of authority and responsibility has varied. Thus the original Act of 1950 provided that the Board, 24 Presidentially appointed members and the Director ex officio, was ". . . except as otherwise provided in this Act [to] exercise the authority granted to the Foundation by this Act." (Sec. 4(a)). The responsibilities of the Director as provided for in 1950 were:

1) to be chief executive officer.

2) "In addition to the power and duties specifically vested in him by this Act, the Director shall, in accordance with the policies established by the Board, exercise the powers granted by sections 10 [award of fellowships] and 11 [do all things necessary to carry out the provisions of the Act] . together with such other powers and duties as may be delegated to him by the Board . . ." Sec. 5(b)

3) ". . . but no final action shall be taken by the Director in the exercise of any power granted by section 10 [award of fellowships] or 11c [award of contracts or other arrangements for the carrying on of (i) basic scientific research activities and (ii) specific scientific research activities at the request of the Secretary of Defense] unless in each instance the Board has reviewed and approved the action proposed to be taken . . ." Sec. 5(b).

4) to be an ex officio member of the Executive Committee.

5) ". . . in accordance with such policies as the Board shall from time to time prescribe, [the Director is to] appoint and fix the compensation of personnel . . ." Sec. 14(a).

6) ". . . may appoint, with the approval of the Board, a Deputy Director . . ." Sec. 14(b).

C. Practice in the Early Years

In its early years, and largely to the present time, Board-Director relationships have encompassed various elements such as: formulation of "National Science Policies," "coordination" of research support activities of other Federal agencies, policies for the conduct of NSF programs, and approval of individual transactions. The carrying out of these functions are further complicated by the position of the Director as a member of the executive branch of the government.

Basically speaking, therefore, under the original Act the Board was to "develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences" and to determine the policies for the Foundation under its responsibilities as the body of the Foundation to exercise powers not specifically assigned to the Director. The Director was to carry them out. It is to be noted, however, that in the making of grants and contracts it was only in the case of those relating to basic scientific research activities and scientific research activities undertaken at the request of the Secretary of Defense that the Act imposed a legal obligation upon the Director to secure the specific approval of the Board. This means that in the early years, except for basic scientific research activities, once a "policy" was established--e.g., to experiment with summer institutes--there was no need for the Director to take the matter up with the Board. In practice, therefore, after a program in such fields as scientific education and scientific information had been sanctioned by the Board, except where a policy matter appeared to be present, the Director was free to and largely did go ahead with making grants and contracts without recourse to the Board. At the same time the Director reported to the Board on the general activities underway pursuant to all Foundation funding as well as on questions of legislation and general policy which were always deemed matters for Board consideration.

During this early period there was, except as noted later, a great reluctance on the part of both the Board and the Director to get into matters of national or even non-Foundation significance. Under the original statute the Board both approved individual basic research grants and fellowships and set fundamental and programmatic policy for the National Science Foundation, while making some limited sorties into the broader area of government and national science policies.

During this period there were forces at work which were calling more and more insistently for some group to assume a strong policy and coordinating leadership with respect to scientific research. This urge was evidenced by the role of the Bureau of the Budget in pressing the Foundation to make an assessment of the programs of the National Institutes of Health. The Administration was apparently feeling the need to fill a vacuum in science policy formulation. It felt that the goals and programs of the government's scientific activities should be more cohesively stated and integrated and that there should be more coordination in the administration of scientific activities within the government lest there be "duplication." The Administration also was looking for a mechanism to evaluate the scientific programs being administered by various government agencies. Given the terminology of the National Science Foundation Act it inevitably and hopefully looked to the National Science Foundation to step into the breach. In the words of then NSF Director Alan T. Waterman (Science, May 6, 1960):

> "In this situation, the National Science Board and the director sought to define more specifically the role of the National Science Foundation in relation to other agencies. After extensive conferences between National Science Foundation staff members and the Bureau of the Budget and other agencies, the foundation made a series of recommendations which were incorporated in Executive Order 10521 of 17 March 1954. The order states that the foundation 'shall . . . recommend to the President policies for the promotion and support of basic research and education in the sciences, including policies with respect to furnishing guidance toward defining the responsibilities of the Federal Government in the conduct and support of basic scientific research.'
>
> "The order further directors that the foundation shall be increasingly responsible for the support of general-purpose basic research but recognizes also

> the importance and desirability of having other agencies conduct their special basic research in fields closely related to their missions. The foundation is not expected to have responsibility for the applied research and development programs of other agencies; each agency is accountable for the scope and quality of its development efforts."

D. Executive Order 10521 (1954).

Executive Order 10521 (1954) represented the high water mark of Administration attempts to find in the NSF the organization that would provide the scientific policy leadership and coordination it sought. (The naming of the Director as Science Adviser in 1973 appeared to be more a personal appointment than another effort to build the Foundation into the overall adviser to the President.) Executive Order 10521 provided in part:

> "Section 1. The National Science Foundation (hereinafter referred to as the Foundation) shall from time to time recommend to the President policies for the Federal Government which will strengthen the national scientific effort and furnish guidance toward defining the responsibilities of the Federal Government in the conduct and support of scientific research.
>
> "Sec. 2. The Foundation shall continue to make comprehensive studies and recommendations regarding the Nation's scientific research effort and its resources for scientific activities, including facilities and scientific personnel, and its forseeable scientific needs, with particular attention to the extent of the Federal Government's activities and the resulting effects upon trained scientific personnel. In making such studies, the Foundation shall make full use of existing sources of information and research facilities within the Federal Government.

> "Sec. 3. The Foundation, in concert with each Federal agency concerned, shall review the scientific research programs and activities of the Federal Government in order, among other purposes, to formulate methods for strengthening the administration of such programs and activities by the responsible agencies, and to study areas of basic research where gaps or undesirable overlapping of support may exist, and shall recommend to the heads of agencies concerning the support given to basic research.
>
> "Sec. 4. As now or hereafter authorized or permitted by law, the Foundation shall be increasingly responsible for providing support by the Federal Government for general-purpose basic research through contracts and grants. The conduct and support by other Federal agencies of basic research in areas which are closely related to their missions is recognized as important and desirable, especially in response to current national needs, and shall continue.
>
> "Sec. 5. The Foundation, in consultation with educational institutions, the heads of Federal agencies, and the Commissioner of Education of the Department of Health, Education, and Welfare, shall study the effects upon educational institutions of Federal policies and administration of contracts and grants for scientific research and development, and shall recommend policies and procedures which will promote the attainment of general national research objectives and realization of the research needs of Federal agencies while safeguarding the strength and independence of the Nation's institutions of learning."

The order then went on to attempt to minimize the difficulties caused by the status of the Foundation as a sister agency rather than an oversight group in the White House, provided that:

> "The head of each Federal agency engaged in scientific research shall make certain that effective executive, organizational, and fiscal practices exist to ensure (a) that the Foundation is consulted on policies concerning the support of basic research, (b) that approved scientific research programs conducted by the agency are reviewed continuously in order to preserve

> priorities in research efforts and to adjust programs to meet changing conditions without imposing unnecessary added burdens on budgetary and other resources, (c) that applied research and development shall be undertaken with sufficient consideration of the underlying basic research and such other factors as relative urgency, project costs, and availability of manpower and facilities, and (d) that, subject to considerations of security and applicable law, adequate dissemination shall be made within the Federal Government of reports on the nature and progress of research projects as an aid to the efficiency and economy of the overall Federal scientific research program."

And then the Executive Order proceeded to place the Foundation in a leadership role in securing order and consistency in the classification and reporting of scientific activities funded by the Federal Government:

> "Federal agencies supporting or engaging in scientific research shall, with the assistance of the Foundation, cooperate in an effort to improve the methods of classification and reporting of scientific research projects and activities, subject to the requirements of security information."

It also called upon the Interdepartmental Committee on Research and Development (ICSRD), a coordinating group established in 1947 and chaired in 1954 by the Director of the National Science Foundation, to provide information on major equipment and facilities which could serve the needs of more than one agency.

But the hopes the Administration placed in the powers it extended to the Foundation in 10521 were not to be fulfilled. The Foundation reiterated its faith in basic research and the collective wisdom of the scientific community. It undertook some specific tasks; thus it organized a Special Commission on Rubber Research (1955) which, through its recommendations, effected the dismantling of the government synthetic rubber effort. During the 1950s the Foundation also produced several reports dealing with various aspects of national science policy. Thus it sought to examine, with the help of two different committees, the problems of government-university relationships (1958). These reports called attention to the need for Federal agencies to treat the costs of universities on a uniform basis. Such course of action was later put into effect through the offices of the BOB. Its report on facilities was instrumental in the eventual provision of funds by several government agencies for laboratory refurbishment and opened up the road to later programs of departmental and institutional support.

But the Foundation did not provide overall leadership with respect to Government budgets or policies for science. While the Foundation issued various specialized reports in addition to the more general reports of the type set forth above and increasingly collected and published statistical reviews such as Federal Funds for Science, it resisted efforts to become a coordinator of Federal scientific activities or programs and refrained from expressing views as to the programs and budgets of its sister agencies.

A notable exception to its avoidance of commenting on the programs and activities of sister agencies was that relating to the National Institutes of Health. The Board, in 1955, after strong urging from the BOB and a direct request from the Secretary of HEW appointed a Special Committee on Medical Research Activities of the HEW. Its report known as the "Long Report" was transmitted to the Secretary of HEW but was never released and apparently never was acted upon. This exercise seemed to reinforce the belief that probing into the activities of other agencies was not a function that the Foundation could pursue with success.

Finally it must be noted that at this time a notable example of an NSF policy casting its aura on the government as a whole occurred when the Board set forth its policy regarding considerations of loyalty (of a principal investigator) in the support of non-classified research in approving a grant for a principal investigator refused by HEW. This action led to the adoption of an almost identical policy by the President of the United States for the Government as a whole after he had requested and received a recommendation from the National Academy of Sciences paralleling that of the Board. (See NSF Sixth Annual Report 1956.) *

After the nation was jolted by the launching of Sputnik in 1957, various actions took place which to a major extent relieved the pressure on the Foundation to exercise leadership in developing and recommending National Science Policies. These included the creation of the post of Science Adviser to the President, major increases in the research budgets of several Federal agencies, the enactment of the National Defense Education Act and the development of new institutional arrangements.

E. Executive Order 10807 (1959).

In March of 1959 the Administration, having become convinced of the need for a more effective manner of promoting interagency cooperation and coordination in the planning and management of Federal scientific and technological affairs, by Executive Order 10807 established the Federal Council for Science and Technology, with the President's Special Assistant for Science and Technology as chairman. This order effectively suspended the Foundation's coordinating role (Section 2) except for the field of scientific information (Section 10). It also reduced its advisory role from one covering "scientific research" to "basic research and education in the sciences" (Section 6). Some of the provisions of this order--namely, those establishing the Federal Council for Science and Technology in the Executive Office and specifying its functions and those relating directly to the Foundation follow:

"Section 1. Establishment of Council.

> "(a) There is hereby established the Federal Council for Science and Technology (hereinafter referred to as the Council).

"Section 2. Functions of the Council.

> "(a) The Council shall consider problems and developments in the fields of science and technology and related activities affecting more than one Federal agency or concerning the overall advancement of the Nation's science and technology, and shall recommend policies and other measures.

"(1) to provide more effective planning and administration of Federal scientific and technological programs,

"(2) to identify research needs including areas of research requiring additional emphasis,

"(3) to achieve more effective utilization of the scientific and technological resources and facilities of Federal agencies, including the elimination of unnecessary duplication, and

"(4) to further international cooperation in science and technology.

"In developing such policies and measures the Council, after consulting, when considered appropriate by the Chairman, the National Academy of Sciences, the President' Science Advisory Committee, and other organizations, shall consider

"(i) the effects of Federal research and development policies and programs on non-Federal programs and institutions,

"(ii) long-range program plans designed to meet the scientific and technological needs of the Federal Government, including manpower and capital requirements, and

"(iii) the effects of non-Federal programs in science and technology upon Federal research and development policies and programs.

"(b) The Council shall consider and recommend measures for the effective implementation of Federal policies concerning the administration and conduct of Federal programs in science and technology.

. . . .

"Section 6. Other orders; construction of orders. 4

"(a) Executive Order No. 9912 of December 24, 1967, entitled 'Establishing the Interdepartmental Committee on Scientific Research and Development," is hereby revoked.

> "(b) Executive Order No. 10521 of March 17, 1954 . . . is hereby amended:
>
> > "(1) By substituting for section 1 thereof the following:
> >
> > > "'Section 1. The National Science Foundation (hereinafter referred to as the Foundation) shall from time to time recommend to the President policies for the promotion and support of basic research and education in the sciences, including policies with respect to furnishing guidance toward defining the responsibilities of the Federal Government in the conduct and support of basic scientific research.'

. . . .

> "Section 10. The National Science Foundation shall provide leadership in the effective coordination of the scientific information activities of the Federal Government with a view to improving the availability and dissemination of scientific information. Federal agencies shall cooperate with and assist the National Science Foundation in the performance of this function, to the extent permitted by law."

The Foundation, besides initiating items for Federal Council study and consideration put a great deal of effort into supplying it with information, studies, and reports as well as furnishing staff for its committees. This, it should be noted, was an Executive Office of the President effort with strong participation by the Director and staff but with minimal Board involvement.

F. Public Law 86-232 (1959).

In September of 1959 the Congress in Public Law 86-232, an act intended primarily to strengthen the Foundation's authority to support educational programs, softened the requirement that the

Board had to review and approve each proposed fellowship award and each grant or contract for basic scientific research by providing that "such act [may be] taken pursuant to the terms of a delegation of authority from the Board or the Executive Committee to the Director." This Act also amended the provision relating to the Executive Committee and provided that the Director would be a nonvoting, ex officio member, along with not less than five nor more than nine other members elected by the Board from among their number.

G. Reorganization Plan No. 2 of 1962.

The Kennedy Administration made another attempt to fortify the science adviser role in the White House, partly through putting it on a statutory base. Rather than seek legislation from the Congress, the Administration used the Reorganization Act of 1949, then in force, and through Reorganization Plan No. 2 of 1962, established in the Executive Office of the President, the Office of Science and Technology. The necessary statutory functions were supplied by transferring from the National Science Foundation to the Director of the Office of Science and Technology:

> 1) "So much of the functions conferred upon the Foundation by the provisions of section 3(a)(1) of the National Science Foundation Act of 1950 . . . as will enable the Director to advise and assist the President in achieving coordinated Federal policies for the promotion of basic research and education in the sciences."

2) "The functions conferred upon the Foundation by that part of section 3(a)(6) of the National Science Foundation Act of 1950 . . . which reads as follows:

> "'to evaluate scientific research programs undertaken by agencies of the Federal Government' . . ."

This Reorganization Plan is also notable for its efforts to enhance the authority of the Director of the National Science Foundation. Thus, it changed him from an ex officio nonvoting member of the National Science Board into an ex officio voting member and made him eligible to be Chairman of the Board. It also abolished the old Executive Committee of the Board and established a new one of five members, of which the Director was ex officio chairman, and removed "so much of the functions conferred upon divisional committees by . . . the National Science Foundation Act of 1950 . . . as consists of making recommendations to, and advising and consulting with, the Board." This, in effect, made the divisional committees, which the original NSF Act of 1950 prescribed as advisory bodies to be appointed by the Board and as advisory to the Board, responsible to the Director. Although still appointed by the Board they would henceforth legally report to the Director. This appeared to reflect the view that their advice dealt primarily with the operations, rather than the policies, of the Foundation and hence should go to the Director.

The removal of the evaluating and general coordinating functions were merely an acceptance of an established fact; for various reasons the NSF had always shied away from fulfilling them. The partial removal of the policy function, to permit the new office to coordinate "Federal policies," did not negate, of course, the authority of the Foundation to recommend national policies. Moreover, the primary responsibility for endeavoring to coordinate Federal policies and programs had long since passed to the Federal Council and the Bureau of the Budget.

H. Daddario Act of 1968.

No major changes in the distribution of power between the Board and the Director occurred from this time until the Daddario Act of 1968, except that in 1965, by Reorganization Plan No. 5, the divisional committees were abolished. This had the effect of permitting the Director to appoint the members of the divisional committees who already, pursuant to earlier Executive Order, reported to him. In practice, the Director continued to consult the Board and seek its advice before naming persons to these committees, and not only shared advice given but arranged for annual presentations by the committees to the Board.

After George P. Miller had become chairman of the Committee on Science and Astronautics, and Emilio Daddario chairman of the Subcommittee on Science, Research and Development, the Subcommittee had a review of the first 15 years of the National Science Foundation prepared by the Science Policy Research Division, Legislative Reference Service, of the Library of Congress. This report, which was issued in 1966, became the basis for extensive hearings before

Mr. Daddario's Subcommittee in 1967 and early 1968, leading to enactment of the Daddario bill (PL 90-407) on July 18, 1968. Through this Act it was clear that the Congress was endeavoring to reinstitute in the Foundation some of the functions transferred to the White House under the reorganization plans, to strengthen the Board in its policy-making role, and to strengthen the role of the Director as chief executive officer. Thus, the Act required the Board to report annually to the Congress on the status and health of science. The Board was permitted a staff of five professionals. With regard to the authority of the Director, the bill authorized a Deputy Director and four Assistant Directors to be appointed by the President with the advice and consent of the Senate and, of greatest importance in understanding the motivations and expectations of the Congress, the basic relationship between the Board and the Director was reversed and all residual authority relating to the Foundation was vested in the Director instead of the Board.

It will be recalled that under legislation passed in 1959, the Board had been given authority to delegate to the Director the approval of grants and contracts and of fellowships. Under this authority the Board had made a delegation to the Director to proceed with such actions where no policy issue was involved, except where a total commitment of $500,000 in any one year, or $2,000,000 in all, was involved. The Daddario Act seized upon this arrangement and legislated that the Board could delegate approval of grants and contracts for scientific activities (which now included fellowships) up to these amounts, but the power to delegate was limited in that no longer could the approval of transactions above those amounts be delegated. This restriction on delegation came at a time when the act contained for the first time a provision that "The Board . . . may delegate to [the Executive Committee] or to the Director or both such of the powers and functions granted to the Board by this Act as it deems appropriate." (See 4b.) There is no other limitation on this authority to delegate, except that the Director may not redelegate the authority to make policy, so it must be concluded that the Congress placed special importance on the responsibility of the Board in the grant-making process. This was probably an echo of the geographic concerns and fears of monolithic control expressed in the earliest debates.

It should also be noted particularly that the Congress provided that "The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." This is a restatement of the policy function, part of which had been transferred to the White House by the effect of Executive Orders and reorganization plans, and constituted a deliberate reaffirmation of the desire of Congress for the Foundation to play a role in science policy formulation. This time, however, both the Board and the Director were encompassed in the mandate.

In strengthening the position of the Director as chief executive officer, the Act still sought to ensure the participation of the Board in essential aspects of Foundation administration. Thus,

> "The formulation of programs in conformance with the policies of the Foundation shall be carried out by the Director in consultation with the Board";

and

> "There shall be within the Foundation such Divisions as the Director, in consultation with the Board, may from time to time determine";

and, finally,

> "The Director shall, in accordance with such policies as the Board shall from time to time prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act."

I. Summary.

From this historical sketch there can be discerned a clear and persistent yearning on the part of both the Congress and successive Administrations for the Foundation, especially the Board, to perform a greater role in advising the Government on the needs of science, particularly basic science and scientific education, and in making recommendations of a policy nature looking towards fostering the strength of the nation's science. However, there is no longer any expectation that the Foundation will act as a coordinator.

As to the internal dynamics of the Foundation there appears to have been agreement over the years that the Board should determine policies for the Foundation and should participate with the Director in the establishment of programs to carry out adopted policies. The actual administration of the Foundation and its programs has been increasingly seen as the responsibility of the Director, although there has been an underlying reluctance to remove the Board from all responsibility related to operations, particularly that for the award of funds for scientific activities.

II. The Role of the National Science Board at Present and in the Future

The preceding resume of legislative and executive events indicates that although the National Science Board's responsibility for approving individual grants and contracts for scientific activities has actually been increased in recent years by legislative action, it has been regarded by both the Congress and successive administrations as having as its primary responsibility the determination of Foundation policies and the recommending of policies--whether or not they can be implemented by the Foundation in whole or in part--for the strengthening of basic research and education in the sciences.

A. The Board's Role in Approving Individual Transactions.

Partly because of the manner in which the Foundation came into being, partly because of the accepted roles of private foundation boards, and partly owing to the distrust of creating a "czar" over provision of federal funds to the scientific community, the Congress has continued to hold the National Science Board responsible for the approval of individual grants and contracts. It would appear that this burden must be eliminated by legislative action or be materially eased by effective procedures, if the Board is to have the time required to function to its full potential as the policy body for the Foundation and as a source of policy recommendations relating to the strengthening of the basic research and scientific education effort of the country. Removal of this detailed operating responsibility would clearly radically increase the time available for Board consideration of policy matters. It would also foster a significant change in its orientation and consequently in its methods of work, which could greatly enhance its role as a policy body.

Under the present National Science Foundation Act there is no way for the Board to fully relieve itself of its responsibility for approving individual transactions, as even where it does not specifically approve an action the transaction is approved under a delegation to its agent the Director. Therefore, it is recommended that a determined effort be made at the appropriate time to have Section 5(e) removed from the Act (5(e) is the statutory provision requiring prior approval of the Board, specifically or by delegation within limits, before the Director makes grants or contracts for scientific activities). It should be realized, however, that even if this obligation were deleted from the Act, the Board would have a continuing responsibility to assure itself that its policies were being carried out in the award of funds for scientific activities. I would propose, therefore, that whether or not the requirement of Board approval is repealed, the Board severely limit its participation in the review of proposed grants and contracts for scientific activities. (The Board's role in the award of fellowships does not appear to pose any problems.) It is submitted that the primary responsibility of the Board with respect to individual research awards is to ensure that they are processed under procedures which assure that they are made pursuant to Board policies. Individual grants or contracts should be examined by the Board in depth (whether or not they exceed the limits of the Board's delegation to the Director) where existing policies do not clearly sanction approval. In other cases Board oversight should primarily concern itself with assuring compliance with its policies.

In order to satisfy the responsibilities of the Board, complete sets of policies and procedures involved in the award of funds for scientific activities should be prepared by the Director and be presented to the Board for discussion, amendment, and approval.

(1) Policy Compendium.

The policy compilation should endeavor to cover all significant policy questions which arise in making awards under approved programs. It should also include a list and description of programs which have been approved and to which, so long as the Board must approve, or delegate the approval, of individual transactions, the basic delegation to the Director for taking final action without recourse to the Board applies. The policy compilation should of course cover a multitude of other matters such as geographical distribution, division between large and small grants, provision for young investigators, and so forth. The policies statement should encompass not only those policies which have already been mandated by the Board, but also, so far as possible, policies to cover pertinent areas of concern which can be identified and where no written policy guidance exists. These compilations should not be rigidly systematic and detailed codifications but should be done with imagination and a sincere effort to set forth the philosophy of the policies, leaving to the Director and staff the job of providing necessary detail in the course of administration. It will take a group of informed, intelligent, and imaginative people,working in close liaison with a Board committee, a considerable length of time to do this properly, but it should be well worth the effort. Once done, the compendium could be amended and kept up to day with relative ease.

(2) Procedures Compendium.

The procedures should detail for each program the manner in which proposals are received or solicited, the manner in which reviews are made, the type of peer review, and the role of individual staff officers in exercising judgment in negotiations and in recommending approval or disapproval. The internal review process leading up to final approval or recommendation to the Board should be precisely stated. These procedures should be standardized for all programs to the greatest extent feasible.

In this connection, it should be noted that the dollar limitations embodied in the delegation to the Director do not necessarily identify those individual transactions which most merit Board consideration. The procedures, therefore, should include a method for screening out those proposals or proposal awards which, although below the dollar limitations of the delegation, raise a policy issue. As the General Counsel is now represented on the review boards it might be well to assign to him, as adviser to both the Board and Director the responsibility for identifying such matters for presentation to the Board. Even if Section 5(e) were to be removed, the Board would still need to have proposed awards involving policy determinations placed before it, and might also wish to have a sampling of transactionsbased upon size or field referred to it for scrutiny as a method of satisfying itself that its policies were being carried out and were working satisfactorily.

The procedures should, in my opinion, include provision for ad hoc audits to be made by scientists and scientific administrators outside the Foundation, and as far as practicable outside the review system. These audits, in addition to stating findings with respect to the merits of the action itself, could contain findings and suggestions relating to the procedures used, and applicable policies, and, one hopes, provide an independent assessment of a particular program as a whole. The results of the audits should be reported directly to the Director or his Deputy. The Director could then report these findings, periodically, to the Board.

The matters mentioned as those to be included in the compendia of proposed policies and procedures relating to awards in support of scientific activities are, of course, only illustrative. The documents should cover the policies which can be identified as existing or as needed and the procedures should encompass a complete system but not, necessarily, spell out all the details. The policies and procedures as amended and formally adopted by the Board should be indexed, coded, and maintained in a current state, only being altered by specific resolution of the Board or being amplified by authority of the Director.

(3) Specialization within the Programs Committee.

At least while the present legal requirements apply, the Board might be well served by having small specialized subcommittees of the Programs Committee review in depth proposed grants and contracts in specific fields. The consideration by the Board as a whole prior to formal action could then more easily concentrate on any policy issues involved.

(4) Future Board Stance in Regard to Individual Transactions.

When compendia of such policies and procedures (including a provision for spot audits) are approved by the Board, it should feel free to restrict itself mainly to the policy implications of individual transactions coming before it. If the Board feels confident after such a system has been in operation for a reasonable period of time that the system is ensuring that the processing of transactions is in conformity with its policies, the NSF should then endeavor to secure the repeal of Section 5(e). The basis for such request could be that the Board has approved the policies and procedures under which awards are made, that there are sufficient safeguards to assure that departures from established policy will be placed before the Board before action is taken, and that it is not feasible for a large part-time group to both give individual consideration to a multitude of research transactions and still give adequate attention to its policy role.

B. The Board's Role in Policy Formulation.

As previously stated the Board's role which is generally accepted as its major responsibility is that of establishing the policies of the Foundation and making recommendations for policies to increase the scientific potential of the country.

(1) The manner in which a policy issue may arise or a policy be laid down, however, may vary widely.

(a) A policy issue may arise in many ways such as: from an awareness of a problem on the part of a Board member, or in connection with a specific matter being considered by the Board, or from an issue posed by the Director, or from a study initiated by the Board or one of its committees in relation to a perceived problem, or from an action or request of another arm of the Government, e.g., the Office of Management and Budget or the Office of Science and Technology Policy.

(b) A policy may be made known in many ways such as: by a specific resolution of the Board, by the implications inherent in an action of the Board, such as approving a program or declining to approve a grant, or by adoption of all or part of a formal report. Such a report can be the result of an in-house staff study, can follow from the deliberations of a Board Committee or a committee or Commission appointed by the Board, or of work done under contract, or of any combination of these.

It is recommended that all policies relating to the Foundation be enunciated overtly and specifically by the Board and be adopted by formal resolution. In the illustrations given above the Board Resolution extending the general Delegation to the Director for approving grants and contracts to a specific program would constitute such an action in that it would clearly give approval for the policies of a specific program. In the case of implications contained in a specific action, however, the policy should be distilled out of the action, formulated and approved by specific resolution of the Board. Only in this way will it be possible to create and maintain a cohesive body of policies to govern the actions of individual staff members. The preparation of resolutions for the Board embodying such hidden policy determinations should be the responsibility of the Board's staff.

(2) Instruments for the Preparation of Policy Positions.

The Board's standing committees constitute central places where issues can be studied and discussed and recommendations can be prepared for formal Board action enunciating policy. The present mandates of the committees should, however, be altered.

(a) The Board and its Budget Committee

The Budget Committee under present and proposed responsibilities and procedures appears to be well linked to the budget process from the earliest discussions as to future roles for the Foundation, through formulations of possible future budgets and up to the final decisions relating to the submission of a budget to the OMB. However, the Budget Committee should augment its tasks by assuming those policy and planning functions relating strictly to the Foundation heretofore considered part of the assignment of the Policy and Planning Committee.

Many policies are made in the normal process of getting and spending in budget and program activities. Others can be raised and studied and recommendations made as part of the planning process. Over the years the ability of the Board to influence, if not wholly control, the preparation of the

Foundation's budget has been greatly enhanced. The Budget Committee would appear today to have good opportunities to make recommendations to the Board which as adopted will have great effect in molding both the long-term and short-term budget positions of the NSF subject, of course, to the restraints placed upon the Director and the Foundation by the office of the President. Thus, the Board's ability to determine policy through the budget is limited mainly by the overriding decisions of the President, largely as exercised by OMB, and by actions of the Congress. The Board can, however, make its views known before the budget process is reached, and should be able, over the course of time, to press its positions, primarily by issuing policy reports and appearing before the OMB. On rare occasions of unusual importance the Board or members thereof may be able to go directly to the President. In any event, annual and special reports can have a long-term influence on the Congress.

(b) The Board and its Programs Committee

Programs can be considered as being developed before, during, and after the budget process. Under present practices the Board has the ability to influence, if not completely determine, Foundation programs. Thus, through its Programs Committee, the Board can study issues underlying, not only the development, administration, and curtailment of programs, but also the inclusion in the budget of funds for future programs. With the asistance of the Budget Committee, the Board has a continuing opportunity to mold the ongoing and future programs of the Foundation and to significantly influence the activities which the Foundation will undertake, as well as the relative emphasis placed on different programs. The Board, with the help of the Programs Committee, can monitor the policies governing individual programs through consideration of individual projects, and through periodic review of the program as a whole. It is through the Programs Committee that recommendations and guidance for Foundation programs can augment policies adopted by the Board after deliberations in the Policy or Budget Committees. These recommendations can directly affect such matters as the creation, nurture, or abandonment of major research facilities, or the extent to which the Federal Government will provide support for basic research on the basis of individual project selection versus the nurturing of a limited number of institutions of excellence.

It should be noted that under present practice the Board retains the function of approving all individual grants in a new program until it is satisfied that the ground rules are well established and are satisfactory to it. It is the Programs Committee which takes the lead in these matters. This practice together with occasional program reviews affords full opportunity for determining the policy to govern each individual program and to insure timely changes in policy where desirable.

(c) Committee on National Science Policy

It is recommended that the Planning and Policy Committee be reconstituted as the Committee on National Science Policy charged solely with preparing recommendations to the Board for it to carry out its portion of the Foundation's responsibility to ". . . recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." (Sec. 3(d).)

This mandate appeared in the original act of 1950 as a responsibility of the Foundation and, hence under the residual authority clause existing at that time, this policy function rested basically with the Board. This authority, as explained above, after being greatly reduced by Executive Orders and Reorganization Plan No. 2 of 1962 was consciously and specifically restored--and this time as a responsibility of Board and Director--by the Daddario Act of 1968. It would seem, therefore, that greater efforts should be made to carry out the intent of this provision and thus to respond to the Congressional perception of need. It is recommended that this be the sole assignment of the Policy Committee. This would assure that efforts to fulfill this function would be protected from diversions arising from the inevitable crises associated with the budgetary and program affairs of the Foundation.

The Policy Committee should devote itself to problems and issues having general government or national reach, whether or not the Foundation could itself be affected or play a part in carrying out any recommendation. Such policy matters would include, but by no means be limited to, such problems as alternative institutional arrangements for research, institutional science support, the creation or maintenance of centers of scientific excellence, the weight to be given demographic factors, the appropriate balance between academic and other research performers, alternative mechanisms for the support of research (e.g., changes in the tax laws), impact of laws and federal regulations on research by industry, how to better match federal programs with available technical and scientific manpower (and vice versa), and policies for international scientific activities, including the assurance of smooth financing.

The biennial Science Indicators, particularly if supplemented by analytical studies indicating the need for a given course of action, should become an effective mechanism for the Committee to isolate, study, and recommend national science policies. Recommendations buttressed in this manner should have influence on the universities, the Administration, and the Congress.

The Policy Committee should, of course, be assisted by staff as suggested later in this report, but to be effective would undoubtedly have to devote fairly sustained attention to its tasks. It should be prepared to give its comments by mail on materials supplied by the staff and to meet for reasonable periods at the time of Board meetings.

It is recommended, moreover, that when necessary it be prepared to meet for up to a week at a time once or twice a year in order to have time enough to adequately examine, discuss and formulate its recommendations.

A crucial element in the usefulness of recommendations of national science policies is in the receptivity of the users and implementers. In some cases the Foundation can partly implement a recommended policy which will give it a trial and some exposure. More importantly, however, the Administration, the Congress, State Governments and the Universities, as the case may be, must be attracted to the merits of a policy in order to have it affect events. The Board, once it has considered the recommendations of its Policy Committee and has formulated a recommended national policy, has various opportunities open to it to spur the implementation of a suggested policy. As appropriate, it can publish--either as a special report or as an inclusion in its annual report or otherwise; it can unofficially or officially call upon the Office of Science and Technology Policy or the Office of Management and Budget and endeavor to enlist support; its Chairman, the Director, or other members can call upon individual Senators or Congressmen or testify before committees. On rare occasions, and if the issue is important enough, a direct conference with the President is a possibility.

After allowing for all these efforts following a recommendation, it must be realized that effectual implementation of a policy is more likely if the recommendation is in response to a need perceived by somebody in a position to implement it. It is recommended, therefore, that in choosing issues upon which to make recommendations, great weight be given to consulting potential users. Moreover, having issued a policy recommendation there should be systematic follow up to appraise the extent to which a policy is being implemented. Such a follow up should also weigh the results achieved. Where appropriate, efforts should continue to foster wider adoption of policies that appear to be successful where applied.

National science policy issues are a concern of the Director as well as of the Board. Moreover, he will be confronted with the need to take positions in intra-governmental contacts on issues not considered by the Board. It is essential, therefore, that the Board be fully informed of positions which the Director has, or expects, to take on such matters so that the Foundation can, to the greatest extent possible, speak with one voice. The Director, however, has two voices--one as a member of the Board, the other as Director--and being subject to the constraints of the Administration of which he is a part may not always be able to support a Board position.

(d) The Executive Committee and the Board

The Executive Committee, besides exercising emergency powers for the Board, offers the Director between Board meetings a more accessible forum for discussing possible policy implications of actions or positions he must take before having an opportunity to consult with the Board. During the almost twenty-five years that the National Science Foundation has been in operation, several attempts have been made to relieve the whole Board of some of its tasks by delegating them to the Executive Committee. None of these efforts, however, has endured, except for emergency and "steering" activities. In the next paragraph a limited coordinating role will be suggested, but it is recommended that a review of Board activities be made with a view to isolating certain actions which could appropriately be delegated to the Executive Committee in an effort to clear more time for the Board to consider major policy questions. In addition, agendas for Board meetings could be constructed in such a manner that minor issues could be isolated and the Board be given the opportunity to refer a package of such matters to the Executive Committee for action. If such a practice were followed it should be possible to greatly shorten the Board agenda.

(e) Staff Support

There remains to be considered the means of staff support for the Board in its policy role. Issues, of necessity, arise in the daily activities of the Foundation. Where these raise policy questions of sufficient importance they will be referred to the Board through the Director, after suitable staff consideration. In this manner the Board can receive an issue fully developed with the pros and cons and the recommendations of the Director. Such a matter can be acted upon by the full Board in the first instance, or can be referred to the appropriate committee of the Board for further consideration and recommendation.

The Board and its Committees, however, must have available to them the resources for gathering facts and for the analyses which only adequate professional assistance can provide. This would be true whether the issue arose from a recommendation of the Director, from the Board, or a member thereof, from a Board committee, or indeed in response to an issue raised elsewhere, perhaps by the OMB or a Congressional committee. To meet the needs of the Board, therefore, it is imperative that it and its committees are assured of adequate staff assistance. The tasks will vary, however, and the staff required will have to command different expertise from time to time. It would appear impractical, therefore, for the Board to have its needs met by a permanent staff of its own. It would appear to be more practical for the Board to be able to draw upon a pool of varied professional talents in addition to its Executive Secretariat. The Chairman and each of the Board Committees needs the services of a full-time, high-level professional whose qualifications and performance are acceptable to them. The Director, likewise, needs a group upon whom he can call for policy coordination and assistance. It is recommended, therefore, that he maintain within his office a high caliber and diversified Policy Group which could meet the Board's and Director's needs for assistance in policy matters. It is recommended (i) that the Director, in consultation with the Chairman of the Board assign from the Policy Group a professional of the highest caliber to serve as Special Assistant to the Chairman and (ii) assign an appropriate professional to each of the major Board committees (Executive, Budget, Programs and Policy) to be available to assist in the work of each Committee at the discretion of its chairman.

It is further recommended that the Policy Group as a whole be given a free hand to enlist the assistance of any member of the staff of the Foundation as required and as appropriate. As the Policy Group would be in the Office of the Director it could be counted upon not to disrupt the normal operations of the agency.

With this type of organization, requests from the Board, its committees or an individual member to have a problem explored, statistics prepared or analyzed, a staff paper prepared setting forth pros and cons or for assistance in preparing a report could be transmitted through the Special Assistant to the Chairman, to the Executive Committee. That Committee could exercise coordination and control over the work to be undertaken. A request as approved by the Executive Committee could then be forwarded to the Policy Group with appropriate Board staff supplying liaison to assure that the product will conform to that authorized by the Executive Committee and required to fulfill the needs of the initiator of the request. In this manner there would be a mechanism available for the Board and the Director to secure the necessary backup for formulating policy recommendations. At the same time, there would be no duplication of staff effort as all the existing staffs would be fully coordinated.

III. Conclusion

The National Science Foundation, consisting of the National Science Board and the Director, is a unique form of government organization. It will function best when the policies of the Foundation, determined by the Board, are understood by all those involved in its operations and when the Director has the greatest freedom to act within well-defined policies. To this end, the Board should endeavor to make its policy determinations explicit. The Board can also make a valuable contribution toward the development of national science policies by giving concentrated study to the problems surrounding the basic scientific research effort of the country and giving the government and the nation the benefit of its independent and expert judgments and recommendations.

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